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THIS 'N THAT

OS-9 Users Group

An **ACTIVE** and **ORGANIZED** Users Group provides a tremendous boost to any product, and we are extremely pleased to see that the **OS-9 Users Group** has all of the features normally found in the more successful Users Groups across the country. It has the FULL and ACTIVE support of the producer of the product, in this case, **Microware Systems Corp.**; it has a centralized meeting location in conjunction with the annual **OS-9 Seminar** sponsored by **Microware**; and it is a well organized Group with strong and well known leadership in people like Pres. **Dale Puckett** (who writes the **KISSable OS-9** Column in **Rainbow** Magazine) and Vice Pres. **Peter Dibble** (who writes the **OS-9 Users Notes** Column in **'68' Micro Journal** Magazine), to mention a couple that you are probably familiar with.

The **OS-9 Users Group** publishes a Newsletter, and the Software Library is now on-line. Initial plans are to provide a "standard selection" of Software to each New Member, while other Programs will be available for a nominal fee or in exchange for further Library Submissions. An active Users Group can play a large part in developing "Standards" within the Industry, as well as providing a fertile base for rapid but controlled expansion and growth within that Industry.

One problem I hope the **OS-9 Users Group** can eliminate or control is the wide variety of "DEFS" Files floating around the OS-9 Community; I presently have over 25 DIFFERENT "DEFS" Files on three different Computer Systems with OS-9 Op Systems. If I try to assemble

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OS-9 TIPS

Tired of hearing your disk drives step at 30ms when you paid more to get 6ms drives? Relief is just a quick debug session away. Want to split that label away from the instruction and add a new instruction at the label location? Read on, these things and more will be explained in this article.

Unfortunately, the user of OS9 cannot use any of his existing FLEX or R/S DOS software with his OS9 operating system. If you want a challenge, you can dump modules to the printer and try to figure out how all the OS9 utilities work, like I have been doing.

I am sure by now most OS9 users have discovered that Tandy has continued the now famous tradition of producing documentation without the aid of proof readers. This makes the challenge twofold, you get to figure out what the documentation is trying to tell you in addition to figuring out how the utilities work. Contrary to what you might have hoped, these two things are not always the same.

A good example of confusing documentation is found in the Getting Started with OS9 book. Notice the last paragraph on page 14. You are told to remove the "blank disk from Drive 0", the very same blank disk you were told to put in Drive 1 in step 2 at the top of the page. Enough criticism, let's get on with the tips you are reading this article to learn about.

Speed up drive step rate to 6ms:

Although the architecture of OS9 allows separate step rates for the different drives in your system, the CCDISK module does not utilize the step rate field in device descriptors. The OS9 technical information manual offers good explanations of the device descriptors. My first attempts at setting 6ms step rate involved patching the device descriptors, D0 and D1, for drives 0 and 1.

After stumbling through bad CRCs and other things I found the changed descriptors to have no effect on the step rate. I knew from prior exper-

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COMPUTER OPERATING SYSTEMS

General

Computer Systems have come a long way in the last thirty years. The first Computers required an operator to have a DETAILED working knowledge of both electronics AND the Machine Language of the Computer to get it to operate. Now ~~days~~ if you know the English Language, you can ~~run~~ a Computer. Although the advancements

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REVIEW

the Complete Personal Accountant

programmer's institute
P.O. Box 3470
Chapel Hill, NC 27514
(919) 967-0861

Req. **Extended BASIC** and at **LEAST 16K**
Tape - $74.95; **Disk** - $79.95

Named descriptively, The **COMPLETE PERSONAL ACCOUNTANT** is not just a double entry bookkeeping program, but a group of ten related programs, plus a menu program, that are loaded as needed.

The 10 Programs are:

CHART OF ACCOUNTS
CHECKBOOK MAINTENANCE
CHECKBOOK SEARCH
DETAIL BUDGET ANALYSIS
SUMMARY BUDGET ANALYSIS
NET WORTH/INCOME EXPENSE
PAYMENTS CALENDAR
APPOINTMENTS CALENDAR
MAILING LIST
COLOR GRAPH

Although one could set it up for a small business, the system seems to be designed primarily for home use. I say seems because you have to look at the design in order to know. The Standard Chart of Accounts lists home type accounts, but I saw nothing that mentioned specific uses. When I requested a tape, in addition to a disk, for this review, I also recieved some ad copy which does mention Small Businesses as possible users.

In all fairness I must say that the home which can use this program to capacity is elaborate indeed. The standard chart of accounts has 66 accounts, to which you may add up to 33 more. (You may also delete or change any of the accounts.)

Because the documentation deals with both tape and disk, I first thought that both were included; but, as with many others, you have to choose between them. This may not be too bad, however, as the programs are apparently the same, so the Tape version can be saved to Disk (but you would need to change the File references). Over all, **COMPLETE PERSONAL ACCOUNTANT** does seem aimed more toward Disk Users.

DOCUMENTATION

The standard sized three ring notebook containing the documentation is nice, but not exceptional. It would be better if the rings were a little larger. For 150 pages, a three quarter inch ring is a little small and binds the pages.

My first impressiion, as I browsed through the extensive documentation, was that it seemed very thorough and well organized. The first dozen pages of "get acquainted" material included; Table of contents, Introduction, Outline of Features, Equipment Comments, and Getting Started. The Getting Started section contains sections on First Time Loading, Media Handling, First Time Processing, Routine Processing, and Error Procedures.

After this opening section, each of the ten programs that make up the system is treated individually. Each section begins with a map of the Options and Operations. Then comes descriptions of the Options and Operations Menus, Program Loading, Data File Loading, Processing and Saving and, finally, Printing to the Screen or Printer (which, by the way is quickly and easily done at almost any time).

In the appendix are about a page and a half of file descriptions (which are duplicated in several sections) and two and a half pages of tips on Double-Entry Bookkeeping. Sample printouts are included where appropriate. Each program gets an average of eleven pages of instructions. The last section of the Manual is a 6 page Index.

THE PROGRAMS

If nothing else, the **COMPLETE PERSONAL ACCOUNTANT** is colorful. I have never seen so many CLS(n)'s, etc. Every section has its own opening rainbow, also. A typical working screen is the Checkbook Maintenance screen, which will probably be the one used most. The screen makes use of a "fill in the blanks" format. You fill out a black check positioned on a yellow background, which is surrounded by black bars. The check has green blanks under inverse headings. At the bottom of the screen is a sub-menu in inverse lettering. At the top of the (yellow) screen is a sub-sub-menu on a green bar, with standard black on green lettering.

The **COMPLETE PERSONAL ACCOUNTANT** is full of bells and whistles (lots of nice 'extras'). This may mean that you have

CoCo POWER

UNLEASH THE POWER IN YOUR CoCo WITH ONE (OR MORE) OF OUR BOARDS.

WORD-PAK $139.95
The WORD-PAK is a video board designed to plug into the expansion port of the Color Computer. The board produces an 80 column video display that compares easily with the high priced terminals. Software, included with the board, provides such terminal functions as; erase to end of line, erase to end of screen, home cursor, x-y cursor positioning, etc. and the ability to re-program the display for different screen formats. This last feature is useful in that it allows software, written for other computers (such as the Model I), to be run on the Color Computer. Additional software support includes a Flex patch, which allows the user to run ALL standard Flex software, and an enhanced version of TEXPRO III (text editor/processor).

MEM-PAK $110.00
16K RAM/ROM expansion board. Expand RAM beyond 64K (using the C-C BUS) or put your programs/utilities in ROM for instant loading. The board utilizes 24 pin, compatible memory devices. (Supplied with 16K RAM).

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BARE BOARDS
Save money by building your own. We will supply complete documentation including schematics, layout and parts list.

WORD-PAK BB	$17.95
C-C BUS BB	$22.95
P-C PAK BB	$17.95
MEM-PAK BB	$14.95

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To celebrate Color Micro Journal's premier issue, we are offering the C-C BUS and the WORK-PAK at special prices. If you order before September 30, 1983 and you mention that you saw the add in Color Micro Journal, you can purchase the C-C BUS for only $129.95. Or you can purchase the WORK-PAK for only $99.95 if you order it with the C-C BUS at the regular price.

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- Comprehensive English language error messages
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For more information contact your computer supplier, or

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Iowa 50312 515-279-8844 Telex
910-520-2535

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some studying to do before you will be able to use the Program to its capacity (that may go for your own Books, as well), but it also provides a lot of capability.

The first thing you will need to do, if you don't want to use the rather massive Standard Chart of Accounts, is make up your own. In this case, you must KNOW your own Books (or Bookkeeping System), and it is easy to leave out things.

To begin using the **COMPLETE PERSONAL ACCOUNTANT**, you load the Menu Program, which then loads your choice of the ten remaining Programs for use. At the end of each program, when using Disk, the menu program is automatically loaded from the disk so you can make your next selection. With the Tape Program, each Program is ended, and you must CLOAD the Menu if you want it again. You can also LOAD or CLOAD individual programs directly, which is almost a necessity with Tape due to the LONG times involved in searching through the tape for a File when automatic loading.

CAPACITY

All of this activity calls for some 77K of Program space. Of course, this means that only a portion can be in use at any one time, and is the reason the **COMPLETE PERSONAL ACCOUNTANT** is broken down into 10 different Programs (which is a normal procedure, even on the larger Computer Systems, for BASIC Accounting Programs). The Programs use Sequential Files, which eliminates the interactive possibilities of Direct or Random Access with Disk Systems (but is required for Tape Storage), but also provides for more efficent use of Mass Storage Space and faster operation of each function, since the Data must be in memory. It also means that the Programs must be as short as possible, to leave as much room as possible for the Data. When a "work session" is completed for each program selection, the Data for the whole period is Saved as a single complete File.

The Checks Program I received left space for 250 entries in a 32K Computer. A 16K Computer would allow 50 entries, and that number is available only with the Tape version (since the Disk Operating System takes up a good bit of RAM itself). You would need to use shorter periods if this was not enough Checks for a month (for example, use one or to week periods, if needed).

CHART OF ACCOUNTS

The step-by-step nature of the Manual makes it fairly easy to to get started using the **COMPLETE PERSONAL ACCOUNTANT**. Instructions clearly explain how to alter the Standard Chart of Accounts for your own use. Account numbers are used, which also helps in the subsequent organization of your Statements.

Once this system is set up, it is saved on the Program Disk (make sure you are using a BACKUP of the Master Disk) for Viewing or Changing, as the case may be. Viewing is done by choosing a Print Statement from the menu. It is not absolutely necessary that you have a printer to use this program, because most of the Print Operations give you the option of printing to the Printer or to the Screen.

CHECKBOOK MAINTENANCE

This is the usually heart of your Bookkeeping System. One option sets up a file for any new period, be it a year, a month, or a week; your choice. After that you will load this (or any other) file and make additions or changes - or simply browse - as needed. When changes and additions are finished, the updated File is saved again.

The actual entry process goes something like this. From the bottom of the screen, below the above mentioned black check, you choose one of seven options: ADD, CHANGE, DELETE, MENU, NEXT, LAST, SEARCH. This is done with a single keystroke. Assuming you chose ADD, another menu immediately appears above the black check, offering: CHECK or DEPOSIT. Again, only a single keystroke is required. The cursor moves to blank number one. You enter a check or deposit number and <ENTER>. Next, at blank number two you enter an account number - <ENTER>. A sub-account number follows, then a six stroke Date MUST be entered; you can't go on without it. You can use up to 15 characters for a Name or Description (no commas please). Enter any amount under a Million Dollars, and then you are presented with another choice; Tax Deductable or not? If it is, a flag is set.

At this point, two other things happen before you go to the next entry. First, you will see a new balance at the bottom, which is updated with each entry - handy if you're running close. Then, you make a basically identical entry for the opposite account. Debits and credits, remember?

If you made an error during your entry, you would choose CHANGE to make corrections. Also, you may move backward and forward to make changes. This is the ONLY way you can correct errors; no aborts may be done during entry. Once a check is started, ALL the blanks must be filled, and THEN a change can be made (other than using a backspace before entering the data for that line).

DELETE, of course allows you to eliminate any check entry. NEXT and LAST (you always press the first letter of an option) move you forward or backward through the list. With SEARCH you can go directly to any check or deposit number. And, when you are satisfied and the Check entries are finished, MENU takes you back to the Main Program Menu.

With this section of the program you have an effective checkbook balancing routine which marks each check off as you go through your Bank Statement. There are little features that figure service charges, interest or dividend payments, etc., to keep that balance fine tuned.

You can Write Checks either through the Program or on your Printer. Special markers are placed on corresponding entries, and you can even dump your whole checkbook to printer.

There are two kinds of saves on the Checks Menu. A Regular Files save MUST be done after each session, but there is also a Checks Summary save which is used by other programs at period endings, etc.

CHECKBOOK SEARCH

This program has much broader Search power than that in the Checkbook Maintanence Program. Assuming you have all of a years entries on one disk, you can quickly call any period in the whole year for Search. You may just browse through the files, or you may search by check number, deposit number, account number, date, or description. NO Changes may be made with this program; that must be done in Checkbook Maintanence.

DETAIL BUDGET ANALYSIS

This is one time when you will

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Articles submitted for publication should be accompanied by the authors **Full Name, Address, Date, and Telephone Number.** It is preferred that articles be submitted as a **.TXT File** on a **FLEX Formatted 5 or 8 Inch Disk,** or as an **ASCII File on a Radio Shack Disk or Tape** (a **/DAT** File). BASIC Programs should be submitted on Disk or Tape in the normal Binary Format.

If articles are submitted on paper, they should be either Typed or Printed **Single Spaced** with a **MAXIMUM Line Length of 4"** on normal 8 1/2" x 11" bond or better paper. A good **BLACK** Ribbon must be used because all paper submitted articles will be photo reproduced. NO hand written articles will be accepted (except required art work which goes with an article). Again, **PLEASE use a DARK Ribbon.**

All letters to the editor should also comply with the above **and MUST bear a signature.** Letters of 'gripes' as well as 'praise' are solicited. We attempt to publish all letters to the editor **verbatim;** however, we reserve the right to reject any submission for lack of 'good taste'. We also reserve the right to define what constitutes 'good taste'.

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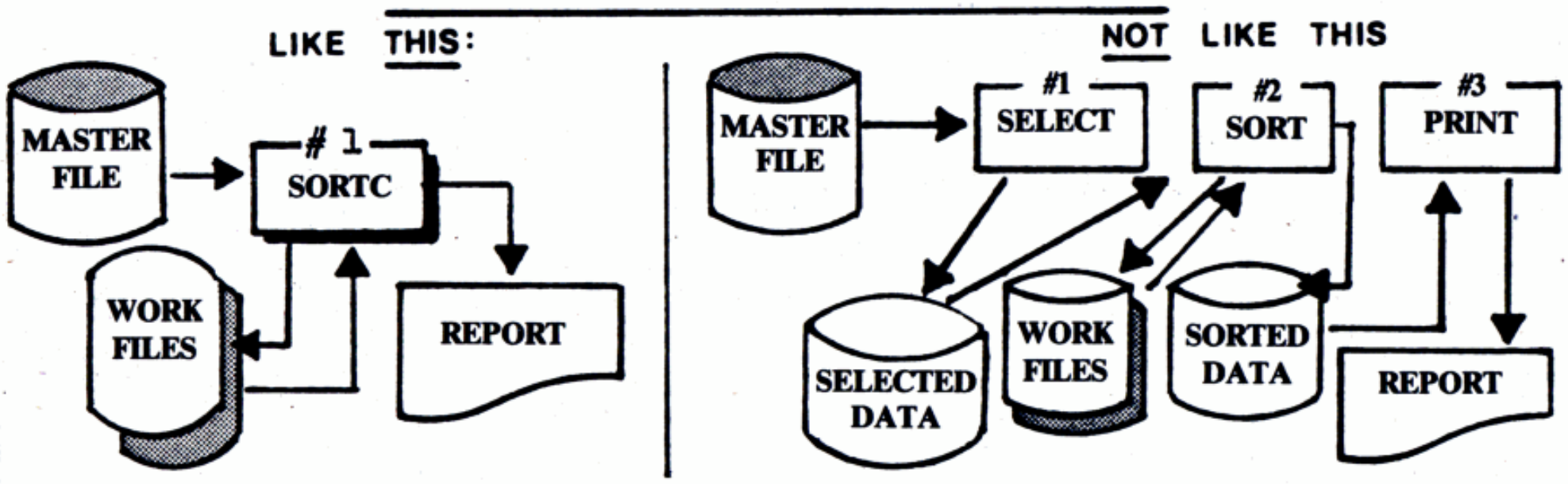
SORTC** for OS9*

THE ONE AND ONLY



BOLDLY GOING WHERE NO SORT HAS GONE BEFORE

SORTC is a high speed, full-record compounding disk sort, which gives microcomputer users mainframe capabilities. It has been specifically designed to sort data efficiently while offering the user great flexibility in designing sort programs. It is written in BASICO9* for use under OS9.

COMPOUNDING FUNCTION

SORTC has the capability of summing user-specified numeric fields on equality of keys. This allows significant savings in memory, disk space, and program development time. A reduction in the number of disk accesses required when compared to other sorts is inherent in the design of **SORTC.**

DISK BASED

Specifically designed to sort large volumes of data, **SORTC** imposes no size restrictions on the amount of data to be sorted. It also places no limits on the number of sort keys which can be used or the order in which the keys are sorted. Furthermore, the sort procedure can be performed as many times as necessary within the same program. This feature allows the programmer to take advantage of any existing data bias, and possibly even reduce the size of the sort key.

ADVANCED DESIGN

While most disk sorts are partially based upon the Fibonacci series, **SORTC** is not. **SORTC** is a generation ahead of the normal sorts based upon the "Fib series". Its unique algorithm is automatically optimized at run time for a reduction in workspace, reduced # of disk accesses and shorter run times. Designed to be as "crash proof" as possible, the sort procedure will not abort if it is accidentally asked to sort zero items.

EASY TO USE

It is not difficult to design a program which will use **JBM's SORTC**. Since **SORTC** is a subroutine, the user may write any procedure he or she wants to format the data for sorting and then to process the sorted data. The sorted data need not be written back to disk, but instead is immediately available. The sort code is automatically inserted into the source procedure by a simple Sort Generator.

ORDERING INFORMATION

SORTC, from **JBM's MIDWARE** line of quality software, is available on either five and one-quarter or eight inch diskettes for a price of $150.00. All of **JBM's** software packages come complete with comprehensive user's manuals.

For more information, or to place an order, contact:

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The JBM Group, Inc.
332 West Church Road
King of Prussia, PA 19406
TEL: 215-337-3138
TWX: 510-660-3999

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VISA and MASTERCHARGE accepted.

JBM'S MIDWARE

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**Uses the same algorithm as JBM's SORTC for Digital Equipment Corp. RSTS Systems.

surely want a printer. Everything you have done is gone over with a fine-toothed comb. Your Chart of Accounts is loaded to keep everything in place. Your most recent Budget Analysis is loaded, as are your Check Files. Dates, Amounts, and Account Numbers fly thick and fast. You may make additions, changes, searches, and deletions. Finally, a neat, detailed, and well organized analysis is printed to Screen or Printer.

SUMMARY BUDGET ANALYSIS

This is similar to the previous report, but has more of an outline form which looks much like a corporate report. Information comes from Check Summary and Detail Budget Analysis Files.

NET WORTH/INCOME EXPENSE

Information for this statement comes from Summary Files, prior Balances, prior Income Statements, and your Chart of Accounts. In addition to this, you have the opportunity to enter records not involving checking accounts, such as cash expentitures and various reciepts not normally routed through checking account deposits. As always, step by step instructions guide you through the process.

CALENDARS

Although not as fast as machine language programs, the Payments Due dates and Appointments can be real conveniences. The computer can remind you who you need to pay or visit, where to go, and when, what job or report must be completed, and so on. The possibilities are almost endless. Lists or Calendar Pages with overall views may be had with the push of a few buttons. You may choose a day or a month from years ahead, assuming that you are that well organized.

MAILING LIST

This, of course, includes an Address List; or rather, Lists. Since your List has a name, and is loaded by name, you can easily have lists for anything you can find a name for. One small but appreciated feature is the two lines available for the address. Both box number and street number can be put on file easily. And when mailing time comes both lines, if used, will be printed.

For simple address finding, it is handy to be able to search for any bit of an Address or Name you can remember. For example, SPR located an address in Spring City, AT located ATKEISON etc. You could even look for AVE or BOB or 15th. You could find Smith by using "th".

When it comes to mailing time you can sort by ZIP, Name (first letter on the line), Address, State, or an Account Number which is available for each address entry; but be prepared to mail to one or all. On the other hand, I suppose separate sub-lists could be made for lists not in either of these extremes.

COLOR GRAPH

If you are visually oriented you will find this one helpful. You can compare just about any amount for any period you specify, with a total for each type of record selected. Expense, Income, Assets, Liabilities, Check Summaries, and Budget figures can all be compared.

IN PASSING

You will probably have a hard time finding more Program for the money than you get in the **COMPLETE PERSONAL ACCOUNTANT**. There are a lot of twists and turns available; some of the features you may never use, but its nice to have them when needed.

Some of the things go a little slow and might not be best for someone with a heavy data flow; but this Program is not aimed at the BIG users, either. On the other hand, if you have a lot of different kinds of things to keep track of, this could be the System for you. I think of a friend who is a Doctors wife and is into everything, everywhere. She is a capable manager and understands bookkeeping, and could use most of the features of this Program. If you don't get along very well with such things, you may be better off finding a less involved program, as this one requires keeping up with.

Business books were mentioned earlier. How useful it might be would depend on a number of things. My business requires quick and easy retrieval of job oriented information. Few affordable programs can give you that in addition to regular bookkeeping. If your business requires pretty standard bookkeeping at regular intervals, the **COMPLETE PERSONAL ACCOUNTANT** might be just what you need.

This is one of the few Accounting Programs to attempt to use some of the Color Computer's color capabilities. My wife is a mainfraim operator, and her first reaction to the heavy use of color on the screen was somewhat negative. I think the main problem is the lack of pastel colors in the CoCo; I found it to be more comfortable after I had turned the Color Level down quite a bit.

There will always be minor complaints; any Program is a matter of trade-offs. In its multi-use nature, the Program Disk must be inserted frequently. There should be prompts for this. Mid-entry abort methods for clutz's like me would be nice. And, I'd like to see it tell you to put a disk in the drive with less than four or five different confusing ways of saying it. You would probably find your own peeves. Oh, what I wouldn't give for the PERFECT Program!

A WORD ON TAPE

The **COMPLETE PERSONAL ACCOUNTANT** works surprising well on tape, all things considered. I did have trouble getting backups of my cassette, perhaps because my system requires a mite more volume than most. But, functionally, it is quite workable once you do that.

If you were to put heavily used programs on short tapes by themselves, you would have a bit of cassette swapping to do, but it would save some long runs to the end of the cassette. And, it would beat spending cash for disk when cash is in short supply.

IN CLOSING

Most of you know this Program as **THE COLOR ACCOUNTANT**. As this review was being finalized for delivery, I learned that the system has been renamed to **COMPLETE PERSONAL ACCOUNTANT** due to the fact that it has been adapted to a number of other computers on the home market. Since that is the name that you will be seeing from now on, I went back and updated the programs name throughout this review.

Jim LaLone

OS-9 *TIPS*

Continued from page 1

iences with the disk controller that the step rate was set with the two low order bits in the control register along with a disk controller command. The controller command register is at $FF48. I started searching for code that stored into this address. Using debug and its "S" command, I found CCDISK had multiple references to the control register address.

Working backwards and looking for A or B register loads which would later be stored into $FF48, I soon found a step command with the low order bits turned on, hex 13. This would step the head at a 30ms rate. I changed this byte to $10 using debug and exited debug. Imagine my elation when I issued a DCHECK command and heard the drive sound like a real 6ms stepping disk drive. If you have any experience with FAST drives, you know what I am trying to say.

Here is a screen image of the Debug session to change the disk drive step rate to 6ms. Do not do this unless ALL your drives are 6ms drives. The change is in common code which is used on all drives.

```
OS9: DEBUG
 Interactive Debugger

DB: L CCDISK      * link module
    BD00 87
DB: . .+1FE       * dot address change
    BEFE 13
DB: =10           * change $13 to $10
    BEFF 8D
DB: -             * check changed byte
    BEFE 10       * looks okay
DB: Q             * exit debug
```

If you don't see the bytes as shown above, you might have a different version of the operating system. My system master disk is marked version 01.00.00. The addresses might very well be different since the CCDISK module may be loaded on a different page in your system. The data should be the same or the change will probably be invalid for your version of the operating system.

I didn't want to do this every time I booted OS9, so I saved the OS9Boot file to disk, updated the CRC and copied it back to my system disk. I won't go into detail on this, since the section on patching OS9 component modules in the debug section of the Program Development manual tells how to do this.

Some other tidbits:

The DCHECK command has an undocumented option, -D, which shows the set bits in the allocation table.

In addition, the DUMP command has TWO undocumented options which are used when you want printer output. The first is -L, which gives a long line, 16 bytes per line instead of the usual 8 bytes on screen output. You can use this when outputting to the screen but it doesn't look very good. The other option is -H, which gives a printout without the header. This is useful for screen output since more bytes are shown on the screen at a time.

The FORMAT command has a couple of additional options. You may include the volume name when you call the format function. This precludes the wait for entry of volume name before verification begins. Make sure you place double quotes around the volume name. Otherwise

a $0D will be included in the volume name. The other option, R, will eliminate the prompt for disk insertion. This assumes the disk is in the target drive and ready for formatting. Be careful with this option, unlike R/S disks, the directory for OS9 starts on track zero and will quickly be written over if you make a mistake.

Now for the EDIT macros. The editor at first glance, seems to be not much better than the extended basic editor you have been using. However, the macro facility makes the editor quite powerful. Here are several macros I came up with during my first session with the editor.

TOP is a simple sequence to show the first screenful of lines at the beginning of the file.

```
TOP
V0 -$ L12
!end of macro
```

SPLT is used to break a line into two pieces. The value of N is the number of words to keep on the first line.

```
SPLT #N
! split line at the Nth blank
V0
[ .SEARCH/ / ] #N
I// <2 K1 - L
!end of macro
```

JOIN will join the current line to the one just before it.

```
JOIN
! join current line to prior line
V0 <1 K1 -0 L
!end of macro
```

One more item. To go to back to R/S DOS, press reset and when you see the OS9 BOOT message, press reset again and you will be back in Extended Disk Basic.

Hope you enjoy exploring and using OS9 as much as I have.

Jack L. Aker

THIS 'N THAT

Continued from page 1

a Program provided by one of those System Manufactures, I must go BACK to the "DEFS" Files that were available **AT THAT TIME**, because the names of the files are different with later Versions of the Operating System. The other option is to list BOTH the OLD and NEW "DEFS" Files, search through the Assembly Listing to see what Calls, etc., are needed, and see if they are included in the NEW one. Obviously, this can be a real project. A second problem is that I have to request over 20K of Memory just to assemble a Device Descriptor (which usually results in about 50 Bytes of Code), because there are now some 750 EQUs, SETs, etc., which have to be loaded to be sure the half dozen needed are there. Hopefully, I "can't see the Trees for the Forest", and someone will come up with a simple solution to this problem, but I'm not holding my breath.

If you are in the least bit interested in OS-9, drop a note to the

OS-9 Users Group
P.O. Box 8027
Des Moines, Iowa 50301

for full information. They, and **ALL** Users, can use **YOUR** support, help, ideas, questions, programs, etc. That's what a Users Group is FOR!

Color Computer Shows

The next subject I would like to discuss this month is the different Color Computer Shows that have been held around the country this year. I don't think **ANY** Show Sponsor has been happy with the attendance since the first one in Chicago last Fall; I KNOW that **VERY FEW** of the Exhibitors have been happy with them. I am **NOT** throwing rocks at any Show Sponsor; I would like to know what **YOU**, as a Color Computer **User**, think! Did YOU attend any of the Shows? If so, what did you like and dislike; why did you go; etc.? If you did NOT go to one, WHY not? What would you LIKE to see at a Show? How far would you be willing to travel to go to a Show? In general, what are **YOUR** thoughts on the subject?

From an EXHIBITORS point of view, we were not very happy with the turn outs at the ones WE attended, and we talked to VERY FEW exhibitors that WERE happy. Most exhibitors are willing to attend a Color Computer Show **IF** they can **BREAK EVEN**; very few can afford to LOSE MONEY when attempting to let **YOU** see their Product **FIRST HAND**. I know of a couple of planned Color Computer Shows that have already been cancelled because of the history of the last several Shows, and I know of SEVERAL exhibitors who will NOT be attending future Shows (even to the point of forfeiting their deposits, since they will lose less money that way than if they attend the Show). Our personal impression was that Exhibitors with HARDWARE for Sale may have come out OK, but the SOFTWARE suppliers lost a lot of money (you have to sell a LOT of $40.00 Programs to offset several thousand dollars Show Expense).

We at **Computer Publishing** have **NO** intention of sponsoring a Show, so maybe WE can act as a "unbiased information collector". We would like to hear from **YOU**, both Color Computer **OWNERS** and **EXHIBITORS**. We will collect the information, and provide it to **ANYONE** who wants it (with Names withheld if so requested). Let us hear from you!

"Let the Buyer Beware"
or
"If the Shoe Fits, Wear It"

I am constantly concerned with the "Mass Marketing" techniques used by Advertisers in the United States, and what it **IS** doing and **HAS** done to the Personal Computer Industry over the years. I am also very sorry to KNOW that the same procedures are used within the Color Computer community. We constantly hear from Users who purchased a "Board" that was advertised to work with 16, 32, or 64K Systems, who found out **AFTER** spending their hard earned money that, first, a Multi-Pak was required (NOT mentioned in the Ad or by the Seller), and, second, that although it would work with any of the Memory Configurations, that was irrelevant, because it only **USES** 16K (which, in this particular case, severely restricts its capability). Or, from someone who purchased a "Super Fast, Better than Arcade" Game, and then found that it used Low Resolution Graphics for the speed, and only had about 10% of the Arcade Versions capability. Or; etc.

BUT, the Advertiser says (in an example like the Board Purchase), "We would have told him if he had asked." **HOW** is a purchaser to KNOW **WHAT** QUESTIONS TO **ASK**? This is the FIRST Computer that MOST Color Computer Owners have been exposed too; they don't have the Knowledge, Experience,

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and "Computer Sophistication" to be able to "read between the lines" in the Advertisements, or to be aware of the "pitfalls" awaiting them in the Computer Industry. Happily, **MOST** Advertisers and Producers in the Color Computer Industry are aware of the situation, and are **RESPONSIBLE** Organizations that support their products **200%**, and make EVERY ATTEMPT to present their products HONESTLY in all of their Advertising. It is the 1% that causes all of the problems. Another factor that must also be mentioned is that the problem may NOT be the PRODUCERS, but one of their "agents" (Dealer, etc.).

More relevant, how do **YOU** find out what is GOOD and what is "not so good"? By reading Advertisements? THEY tell you **WHAT** is available; from **WHERE**! I have been "burned" so many times that if I see a big ad with an eye-catchingly dressed women, for example, I wonder what the Advertiser is covering up! The Advertisers problem is; "How do I catch the Readers ATTENTION when he is leafing through over a hundred pages of Advertisements in a Magazine?".

You have about four options: 1. Buy the product and learn the hard way; 2. See the product in use by someone else; 3. Buy ONLY from those suppliers and ADVERTISERS that you have learned you can **DEPEND** on (usually by method 1. above); or, 4. Depend on Product Reviews published in available Magazines.

Oh yes, there is **ANOTHER** option; STEAL a copy of the Program by copying it from a friend. If it is not any good, you are not out anything, so you can throw it away. Only ....; I'll bet that your FRIEND will tell you that it is NOT any good, and so you WON'T copy it. **BUT**, if he tells you that it IS good, do you go out and **BUY** it, so that the producer of that **GOOD** Program will be encouraged to write SOME **MORE** GOOD SOFTWARE? How would **YOU** feel if you had been paid 10% of your normally expected salary for the work that **YOU** did the last 6 to 18 months? That is about how long it takes to write a DECENT Program. Think about it!

Option 1 costs a lot of money. Option 2 is the most dependable, but it is usually hard to find a friend with almost any product that you might be interested in. Option 3 should be followed in **ANY** case, no matter **HOW** you learned about a product. Which brings us to Option 4; **REVIEWS**.

Reviews can be a real BOON to a Computer User; they can also be the cause of much consternation! **VALID** Reviews are worth more to an Advertiser with a GOOD Product than **ANY** amount of Advertising. Conversely, a BAD review can be a Death Sentence. Again, YOU will probably have to learn "the hard way" which Magazines and Reviewers you can depend on. You are skeptical of Reviews because you feel that the Magazine is not going to "downgrade" one of their Advertisers Products with a "bad" Review, taking a chance on losing that income. In some cases, you may be right; I don't know. There are other problems involved, from a publishing standpoint.

Finding GOOD Reviewers is a problem; someone who is familiar with that type of product, and who can write about it so that you can learn from it. Obviously, if you know NOTHING about accounting, you could not write a decent review of an Accounting Program. Often, WE don't get adequate information with the Product from the producer; what type of User is the Product targeted towards, what Computer Configuration is required, etc. We sometimes receive products for review that do not even have pricing information available. The ADVERTISER has a lot to do with the quality of the Review of his product. As an additional note, SOME Advertisers are extremely "choosy" about where they send Products for Review, ESPECIALLY if they have something to hide. Enough said!

I can only state **Color Micro Journal's** position towards Reviews, and let you make you own judgments. The two primary concerns are 1, "What would YOU want to know if YOU were interested in that Product?", and 2, "Does the Product do what the ADVERTISEMENTS say it does?". That is, the Review should fill in the information "between the lines" of the Advertisements, and provide the details of Operation, Strong Points, and the Limitations that the Advertiser can not afford to discuss in an Ad (or those that they would rather sort of "skip over"). The old "Tell it like it IS" routine! We also like to include some examples of the use of the Product, where possible. This helps YOU, the Reader, learn more about the potential of that Product, and also helps you get a better feel for what is involved in its operation. An example of this type of Review is the one on the **EliteCalc** Program which we ran in the Sept. '83 Issue of **CMJ**.

First, if the Product is "good", there is no real problem except that of finding someone with the experience, Computer configuration, and writing ability to provide a timely review.

If the Product does not work, or the Advertising is mis-leading, then the problems begin. The **PRIMARY** concern of **THIS** publication is the advancement of the Color Computer and its Support Products. The best way to accomplish this is to help you learn how to make greater USE of your Computer, and to help you around the "pitfalls" like poor products. BUT, we have seen, in six years experience with **'68' Micro Journal**, some VERY GOOD products become available that started out as JUNK! The major factor that produced a good product was that the PRODUCER was sincerely interested in providing a GOOD product, and took our reviewers comments as "constructive criticism" and worked from there. Our procedure for a bad review is to get in touch with the producer, and see what happens. Sometimes it turns out that it was a "bad review" of a decent

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product; if so, we try again with another reviewer. Often the producer is willing to make changes to make it a decent product. If the product needs more work, and they are accomplishing this, we "hang lose", and the Review does not get published. If we even get a SUGGESTION that the producer is trying to hide a bad product with fancy advertising, **YOU** will **HEAR ABOUT IT; ASAP.**

It boils down to this; if the Review is published in **Color Micro Journal**, you know what you are getting. If you do NOT see it in **CMJ**, either we do not have it to Review, it is in a "hold pending improvement" state, or it is "in process", meaning either that we are looking for a VALID Reviewer, or that it is now being reviewed.

YES, WE ARE LOOKING FOR REVIEWERS! If you think you would be interested, send me a "review" of something you have as a sample of what you can do, and let me know what your interests are and what your Computer Configuration is (amount of memory, disk, tape, printer, etc.). We would PREFER that you send a "Text" File (DAT File in Radio Shack terminology), either on Tape or Disk, in Radio Shack, FLEX, or OS-9 Format, with NO imbedded Control Codes (just leave a blank line for paragraph separation); and possibly a print-out so we can see how you intended the article to be formatted. Your return as a reviewer will be some new products, which are normally yours to keep, and a small amount of reimbursement (that means "money", y'all) to help defray your expenses.

--- RLN ---

COCO 2 HARDWARE NOTES

HARDWARE NOTES FROM UNDER THE COCO 2 COVER

Radio Shack has introduced a new version of its successful Color Computer. The new Color Computer 2 is fully software compatible with all current Radio Shack software, but third party software and hardware compatibility is another story.

Major design changes have taken place under the COCO 2 cover. To start with, Radio Shack has completely eliminated the 12 volts from the Color Computer 2; it runs almost entirely on +5 volts. The only negative voltage is for the RS232 interface. They have replaced the dynamic 16K chips with 4517 chips. These are 16K counterparts that require only +5 volts. Piggyback upgrades for the older computers will not work here. Other hardware items that will not work "as is" include the RS X-PAD, Eprom Programmers, Video Interfaces, Microtext, old RS Disk Controllers, and Speech Synthesizers. The COCO 2 power supply is now a simple center-tapped transformer with a fuse hard wired into the primary. Take note that CR7 and CR8 are special diodes that have no direct substitutes. These parts can only be obtained through Radio Shack National Parts.

The most obvious external change is the size of the computer and the keyboard. The COCO 2 is smaller than the older Color Computers, measuring 13 3/4"W X 9 1/2"D X 2 3/4"H. The case is no longer "battle ship gray", but a pleasing off-white. The keyboard is still of the conductive rubber type, but has larger, nicer key caps. This is a disappointment, as I thought it would be changed to the mechanical type. The air vent holes are across the rear top of the cover like the "infamous" TDP computers.

Looking inside reveals more interesting changes. To upgrade to 64K is now as simple as 1-2-3! All one has to do is remove the (8) 4517 chips and replace them with (8) 4164 chips. Between IC chips U6 and U7 is W1. Run a jumper wire across the solder feed through holes to the right where W1 is marked and VIOLA, you now have 64K! No more capacitors or traces to cut and no pins to bend up. Old "D" board owners wish they had it as easy. Looking further reveals the absence of the Astec RF Modulator. This is because the MC1372 Video Mixer chip is now being used as both a Video Mixer and RF Modulator. Due to a new redesign in the VDG circuitry, colors from Semigraphics 6 mode do not appear. This again has no effect on RS software, only third party software.

All Color Computer 2's have the new 1.2 BASIC ROM and 1.1 Extended Basic ROM. The new Color 2 Disk Drive Kits (26-3029) contains the new 1.1 Disk Rom reconfigured to work with OS-9. The 1.0 Disk ROM's will work with OS-9, but require the cumbersome task of always inserting a boot disk. With the new 1.1 Disk ROM, all you have to do to boot OS-9 is type DOS. OS-9 is a sophisticated operating system with Multi-User and Multi-Tasking capabilities. It requires 64K RAM, but considering the ease of upgrading and the low cost of 64K chips ($44.95), many COCO 2 owners will soon be exploring the powers of OS-9.

Radio Shack has done some job in bringing in an exciting new COCO product line. Besides the Color 2 and OS-9, there are now Multi-Pak Interfaces, RS-232 Program Paks, Color Mouses, Deluxe Joysticks, Color Ink Jet Printers, and soon to come in 1984 the much rumored "SUPER COCO". We'll leave that one alone for now. You do like surprises don't you?

Bob Rosen

STAR — KIBBITS

My dictionary defines 'deja vu' as the mistaken feeling that you've seen something before, when you really have not. But if you had the feeling last month that you had seen my Kibbits chat before, it wasn't deja vu! You really did see it — the month before that. As you can imagine, writing a new column each month can get somewhat hectic, especially as the deadline approaches... and passes. If this were just a plain article, the magazine could simply put in a note like "Mr. Stark's column will not appear in this issue, and will resume next month." But with an advertisement it's not that simple. I suppose we could have left this space empty...

STAR-DOS PRICE REDUCTION

Our STAR-DOS 64 has had such a good reception that we have decided to permanently drop the price. From now on, the regular STAR-DOS (for 16k and 32k systems) and STAR-DOS 64 (for 64k systems) are being bundled together into a single package which we will call STAR-DOS, and which will have the combined price of $49.90.

Despite the release of OS-9 (a trademark of Microware Systems Corp.) and Flex (a trademark of Technical Systems Consultants) for the CoCo, we expect the popularity of STAR-DOS to keep rising for two very simple reasons. First, STAR-DOS is the only DOS which supports the standard Radio Shack CoCo disk format. Though we all hear about the large amount of software available for Flex and OS-9, the fact of the matter is that there are more programs available for the standard CoCo disk format than for OS-9 and Flex together.

Second, since OS-9 and Flex are also incompatible with regular CoCo Disk Basic, you must buy another Basic to get their full benefits. Notso for STAR-DOS, which can read and write the same files a Disk Basic can.

There is a good number of serious users of STAR-DOS among you; in fact, we have even licensed STAR-DOS to other software developers for inclusion in their own products. We're so enthusiastic about the future of STAR-DOS that we're willing to make you an offer you can't refuse: If you now have a DOS, any DOS for any machine, send it to us and we will trade you for a copy of STAR-DOS. Please — original documentation and disks only, and include $3 for shipping.

To know STAR-DOS is to love it!

COMMTERM IS NOW FREE!

COMMTERM is our communications terminal program for the CoCo and MC-10. You can now get it FREE if you send us a cassette and a stamped self-addressed envelope (with three stamps). After you get it and use it, decide what it is worth to you, and then pay us whatever you like. You have our permision to copy the program and documentation as much as you want, and give it away to anyone you like, providing that you don't make any changes to it. It's a new marketing approach, and we're curious to see what happens.

ARE YOU A PRIVATE PILOT?

If so, then you may be interested in a VFR Flight Planning program for the CoCo, available for $24.95 for tape, or $29.95 for disk, from Frank Lombardi, P.O. Box 373, South Salem, NY 10590.

That's it for now — see you next month.

SPELL 'N FIX

Regardless of whose text processor you use, let SPELL 'N FIX find and fix your spelling and typing mistakes. It reads text faster than you can, and spots and corrects errors even experienced proofreaders miss. It is compatible with all Color Computer text processors. $69.29 in the Radio Shack disk or cassette versions; $178.58 in the Flex version. (20,000 word dictionary is standard; optional 75,000 word Super Dictionary costs $50 additional.)

HUMBUG® — THE SUPER MONITOR

A complete monitor and debugging system which lets you input programs and data into memory, list memory contents, insert multiple breakpoints, single-step, test, checksum, and compare memory contents, find data in memory, start and stop programs, upload and download, save to tape, connect the Color Computer to a terminal, printer, or remote computer, and more. HUMBUG on disk or cassette costs just $39.95, special 64K version for FLEX or STAR-DOS 64 costs $59.95, MC-10 version $29.95.

STAR—DOS

A Disk Operating System specially designed for the Color Computer, STAR-DOS is fully compatible with your present Color Computer disk format — it reads disks written by Extended Disk Basic and vice versa. STAR-DOS for 16K through 64K systems costs $49.90;

STAR FLEX

The best implementation of FLEX for the Color Computer. Complete with all utilities, text editor, macro assembler, and HUMBUG debug monitor, $225.00.

ALL IN ONE — Editor Etc.

Three programs in one — a full function Editor, a Text Processor and a Mailing List/Label program. All this for just $50. Requires STAR-DOS, or FLEX, specify which.

DBLS for Data Bases

DBLS stands for Data Base Lookup System. A super-fast system for searching for a selected record in a sequential disk file. Supplied with SPELL 'N FIX's 20,000 word dictionary as a sample data file — lets you look up the spelling of any word in under FOUR seconds. Priced at $29.95. Requires STAR-DOS.

CHECK 'N TAX

Home accounting package combines checkbook maintenance and income tax data collection. Written in Basic for either RS Disk or Flex, $50.

REMOTERM

REMOTERM — makes your CoCo into a host computer, operated from a remote terminal. $19.95, disk or cassette.

NEWTALK

NEWTALK — a memory examine utility for machine language programmers which reads out memory contents through the TV set speaker. $20, disk or cassette.

SHRINK

SHRINK — our version of Eliza, in machine language and extremely fast. $15, disk or cassette.

EDUCATIONAL SOFTWARE

Introduction to Numerical Methods — college level course on computer math, $75.00, disk or casette.

We accept cash, check, COD, Visa, or Master Card. NY State residents please add appropriate sales tax. Add $3 to above price for AMDEK 3" disk versions.

(FLEX is a trademark of Technical Systems Consultants, Inc. Everything else in this ad is a trademark of Star-Kits.)

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COMPUTER OPERATING SYSTEMS

Continued from page 1

in electronics have produced more powerful Computers for less money, the development of **Computer Operating Systems** has been the real factor in the growth of the Computer Industry.

The earliest Microcomputers had a multitude of switches and lights on the front panel, which the operator used to control the Computer. Some of the switches provided a means for the operator to "Input" information into the Computer, while the lights indicated the "Output" from it. To operate the Computer, the operator turned the machine on and proceeded to insert a program by setting the Input switches, pushing a button to cause that code to be "entered", set the switches to another code, enter that, etc. After an hour or two of setting and entering the switches, he had installed a small program that might read ANOTHER set of switches and perform some function, depending on their settings. He could see if the program worked correctly by reading and decoding the lights. This was all done in BINARY, and required many hours of "programming" to get a simple program installed just to read and react to a particular set of switch settings (consider that several HUNDRED lines of code are involved with the simple BASIC STATEMENT; **PRINT "HELLO"**). Obviously, this did not lead to "efficient" use of the Computer.

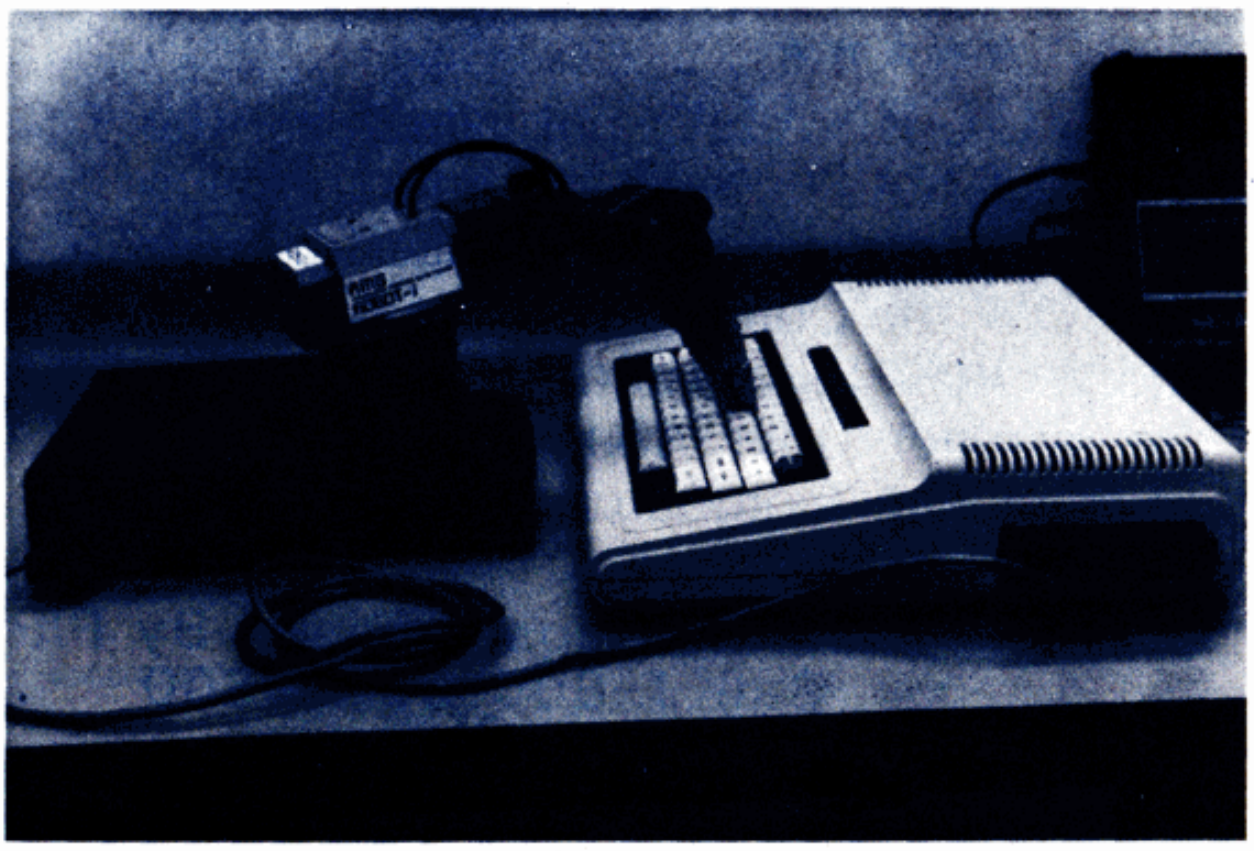
The users of those first Computers were hobbyists whose interests lay primarily in the Digital Electronics area. By entering a program through the switches, they were developing the first rudiments of a **Microcomputer Operating System** (they were developing what we now refer to as a "Monitor" Program; a term used for Programs which allow the User to work DIRECTLY with the Machine Language of the Computer). Since the setting of the switches was extremely time consuming, and had to be accomplished every time the Computer was turned on, a better method of entering the programs and reading the output (i.e., "communicating" with the Computer) was needed.

The next step was to install a 16 or 20 Key Keypad for the Input, and some type of Display, such as the Seven-Segment LED Readouts (such as is used with the Heathkit ET-3400 Microprocessor Trainer). Now, the data could be entered much faster, by entering Hex Data through the Key Pad (with, possibly, a few "special function" keys for GO, ENTER, STOP, SINGLE-STEP, etc.), and the Readout could be displayed directly as Hex Info, eliminating the need to convert from Binary all of the time. This required a Monitor Program which could interpret each Key and install the correct information in the right location in memory, and routines to convert and hold the output to be displayed on the Displays. The user still had to hand code each program in Machine Language, and enter each program from the Key Pad before he could execute it, but this was still many times faster than setting individual switches.

Progress rapidly moved from those beginnings to Teletype machines which provided a full Keyboard Input and a Printer Output, Mass Storage Systems such as Tape Units so that the program could be saved and reloaded in seconds or minutes instead of hours, on through to the Systems that we have today with Keyboard Input and a CRT or TV Output in "English Language", Disk Systems which allow saving and loading programs in milli-seconds instead of minutes, etc. The lower cost Computer Systems provide the complete Operating System in ROM (Read-Only Memory), while the larger and more flexible Systems provide a small ROM'd Monitor which allows reading the desired Operating System off of Disk when the Computer is first turned on.

Each step forward in "Hardware" development required parallel advancements in the Software (or vice versa). These developments provided a means for the Computer Operator to communicate with the machine in a more and more "natural" manner. As time went on, and experience was gained in using Computer Systems, the Operating Systems became more and more Powerful and "User Friendly", accepting English Language Statements such as "Load", "Save", "Print", etc. This capability made the Computer accessible to more and more users.

More Users led to the development of different Computers, but a Program written for one Computer would not run on another Computer. The need arose for an Operating System that would allow one program to be written that



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could run on several different kinds of Computers. While the **Computer Operator** needed to be able to communicate with the computer in a language HE (or SHE) could understand, the **PROGRAM** also needed a common interface that **IT** could understand. Over a period of time, a few Operating Systems floated to the top, such that, once it was installed on a Computer, ANY Program that was written to run with that Operating System, and which used the System provided Input/Output locations, would run on ANY Computer that used that Operating System. Some of the well known Operating Systems that evolved are **CP/M** (in its MANY variations) for the '8Ø Series CPU's, **FLEX** for the '68 Series CPU's, and now, **OS-9**, a Multi-User, Multi-Tasking Operating System for the 68Ø9.

To get a clearer picture of this concept, imagine that the different States in the U.S. are different Computers; that the Highway System is an Operating System; and that various vehicles (cars, trucks, etc.) are the different Programs. The Highway System is "Standardized"; the roads are at least a certain width, there are no brick walls or large ditches across them, etc. As long as the cars and trucks are built to run on this type of surface, they can be used to go to any State in the U.S. Some are large and some are small, some are built to carry a few people and some are built to carry large loads, but ALL are built to run on the Highway System. The Railway System is a different "Operating System", cars and trucks can not run on it; a different type of vehicle is required to run on this System. Likewise, a Radio Shack Program will not run under FLEX or OS-9, or a FLEX Program will not run under Radio Shack or OS-9, etc., because they are DIFFERENT Operating Systems.

A very basic Operating System, such as that provided by Radio Shack with the Color Computers, will allow the User to functionally control the various systems that are a part of the overall Computer System, such as the Tape System, Printer, Display, Disk System, etc. More powerful Operating Systems provide the User with greater capabilities in the operation and control of the overall Computer System, including User Control of the Input and Output of Programs (rather than being tied down to only what the Program was written to accomplish), on up to providing Multi-User and Multi-Tasking Operations, Real-Time Operating Systems for Industrial Control Systems etc.

As with any engineering project, there are always trade offs. An increase in Operating System capability means that the use of the System will be more complex and that more memory and other items, such as Disk Drives, will be required to handle the added capabilities.

Basically, then, a **Computer Operating System** is a Program, or system of Programs, which provides the Computer System USER with an easy means of communicating with, and controlling, the Computer System itself; and also provides a "Standard" interface for Programs. The Computer Chip only understands combinations of ON and OFF; an Operating Systems is required to interpret the Users' English Language statement into a form that the Computer can understand. If you enter **CLOAD "GAME"** on the Color Computer, the Operating System determines that you want to load a Program from the Tape System, then turns on the Tape System, finds the Program on the Tape, gets the information off of the Tape, turns off the Tape System, and lets you know that it has either accomplished the task or run into some problems. It also had to put the information it read from the Tape into the proper place in Memory, in the proper format, and set the Computer System up so that Program could be run. Also, a Programmer can use, for example, the built-in Tape Operation functions, so he does not have to program these features into a Program he is writing to run with this System. Obviously, if we did not have the simple Operating System that Radio Shack provides with the Color Computer, there would not be very many of us that could actually USE the Computer.

Color Computer Operating Systems

There are now three (3) **MAJOR Operating Systems** available for the Radio Shack Color Computer; in order of power, flexibility, and complexity, they are

Radio Shack
FLEX
OS-9

The Radio Shack Operating System could be broken down into a "Tape-Based" Operating System in the BASIC and Extended BASIC ROM's, and a "Disk-Based" Operating System with the Disk BASIC ROM (Disk Operating Systems are normally referred to as a **DOS**). This Operating System is closely tied to the BASIC Language provided with the Computer.

Both **FLEX** and the Color Computer **OS-9** are **Disk Operating Systems**, and are complete "Stand Alone" Programs in themselves; i.e., they are separate Programs that you load and execute just like you would a Color Computer Game. When they are executed, the normal Radio Shack Operating System and BASIC disappear, and are not usable until you turn the Computer off and turn it back on again. If you want to use the BASIC which runs under FLEX, you must obtain the Program, BASIC (or **XBASIC**), and execute it just like you would a Word Processor or Accounting Program. If you want to use BASIC with OS-9, you must obtain **BasicØ9**, which is just another Program that runs under OS-9.

The Radio Shack Tape and Disk Operating Systems are obviously the "STANDARD" Operating Systems for the Color Computer, because every Color Computer built contains that Operating System. **FLEX** and **OS-9** are the primary Disk Operating Systems of most of the **68Ø9-Based Business Computer Systems.** FLEX has been around the longest, and supports a multitude of good working Software. OS-9 has been operational about three years, and has exceptionally powerful Software Development software support (BasicØ9, Pascal, COBOL, C, and a special OS-9 oriented Assembler); some good "Working" Software is now beginning to appear.

The Radio Shack Operating System is the simplest and easiest to use, but has very little user flexibility and power. For example, the only method provided for use of the Printer is through the BASIC Programming Language. For the average Single-User Computer System in a Home or Business Environment, FLEX is unbeatable. It uses a simple, consistent Command Syntax and a Disk Structure that is flexible, yet reliable (and, in most cases, REPAIRABLE, should something happen to the Directory). OS-9 is far and away the most powerful of the 68Ø9 Operating Systems (in fact, it is more Powerful and Easier to Use than most of the 16-Bit Operating Systems available to most of the other Microcomputer Users). Based on the UNIX Operating System, the operator has TOTAL CONTROL of the Computer **and Programs** from the Command Line. While it may appear to be confusing by just reading the Manual, OS-9 is easy to learn by just setting down at the Computer and working with it a little while. OS-9's Disk Directory System provides excellent User flexibility, but a "blown Directory", like the Radio Shack Disk structure, is usually FATAL (i.e., non-repairable).

The **Radio Shack Operating System** is ROM Based, providing immediate response to a Command, but the inclusion of the BASIC Programming Language in the ROMs, along with the memory limitations, restrict the capabilities and flexibility of these Commands. The design of the Operating System, coupled with the fact that it is in ROM, severely restricts the flexibility of the System in that it is hard to add "System Commands", or change those that are provided. On the other hand, the Hardware design of the Color Computer, and especially the capabilities of the 6883 SAM Chip, provide a flexibility unheard of in any other Computer System, and allow the easy installation of more powerful Operating Systems. Where else can you get a Computer for about $3ØØ, and expand it as you learn into a full UNIX style Disk Operating System?

The **FLEX Disk Operating System** is a Program which provides much greater User control and flexibility in using the Computer as a working **"Tool"**. FLEX is strictly a "Disk Based" Operating System (i.e., it is ONLY used with Disk Systems) which resides in high Memory beginning at $CØØØ (the same address as the Color Computers' Cartridge Slot and Disk ROM). This means that to run FLEX (or the Color Computer OS-9), you **MUST** have **BOTH** 64K of RAM and a Disk System. As was mentioned previously, when FLEX (or OS-9) is brought up on the Color Computer, all of the Radio Shack System disappears. FLEX then provides all of the interface between the User (and most Programs) and the Computer itself.

FLEX has a couple of "built in" Commands, but almost all of the FLEX Commands are "Disk Resident"; that is, when a Command is given, it loads it off of the Disk and executes it. FLEX provides some space within the Operating System for these Command Programs to load and run so that they will not interfere with a Program that the User may be running, such as BASIC or an Editor or Word Processor. This allows both the User and the Program to use the System Commands (small Programs that perform a "System" function, such as reading a disk directory, list a file, delete a file, etc., are normally called **"Utilities"**) without leaving the Program itself. Also, by having the Commands on Disk, where they are accessible, they can be easily changed, it is easy to add new Commands to the System, memory space is not tied up, etc. FLEX allows information in a Disk File to be listed to the Display or Printer to examine its

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Auto Run will help you create your title screen with the graphics editor. The graphics editor allows you to choose a background color and border style. Using the arrow keys and several other commands you can draw pictures, block letters and also include text.

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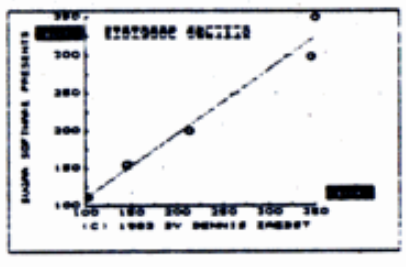
Requires 32K Extended Basic.



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- Upgrade to 64K
- RS to FLEX, FLEX to RS file transfer ability
- Create your own character set
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- Load and save function on FLEX disk
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- External Terminal Program

DATA-COMP has everything you need to make your TRS-80C Color Computer WORK for YOU; from Parts and Pieces to Full Ready To Use Systems. DATA-COMP designs, sells, services, and SUPPORTS Computer SYSTEMS, not just Software. CALL DATA-COMP TODAY to make your Computer WORK FOR YOU!

System Requirements

FLEX9 Special General Version + Editor & Assembler (which normally sell for $50.00 ea.)	$150.00
F-MATE(RS) FLEX9 Conversion Rout. for the RS Disk Controller when purchased with Special General FLEX9 Sys.	$ 49.95
when purchased without the General FLEX9 Sys.	$ 59.95
Color Computer with 64K RAM and EXT.BASIC	$399.95

SPECIAL SYSTEM PACKAGES

64K Radio Shack COLOR COMPUTER, Radio Shack COLOR DISK CONTROLLER, a Disk Drive System, Special General Version of FLEX9, F-MATE(RS), and a Box of 10 Double Density Diskettes, a COMPLETE ready to run SYSTEM on your Color TV Set.

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These Package include the Radio Shack Disk Controller, Disk Drives with Power Supply and Cabinet, and Disk Drive Cable:

PAK #1 - 1 Single Sided, Double Density Sys.	$389.95
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PAK #4 - 2 Double Sided, Double Density Sys.	$919.95
PAK #5 - 2 Qume Thinline Double Sided, Double Density Sys.	$699.95
PAK #6 - 2 Tandon Thinline Single Sided, Double Density Sys.	$599.95

PRINTERS

EPSON RX-80	$375.00
EPSON MX-100	$725.00
EPSON MX-80	$395.00
EPSON FX-80	$599.00

SERIAL BOARDS

MX-Series	$119.95
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Plastic Library Box		$5.00ea

PARTS AND PIECES

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1 Double Sided, Double Density Disk Drive Qume	$319.95	Micro Tech. Prods. Inc. LOWER CASE ROM Adapter	$ 74.95
1 Qume Thinline Double Sided, Double Density	$249.95	Radio Shack BASIC Version 1.1 ROM or 1.2 ROM	$ 34.95
1 Tandon 40 Track SSDD with Cabinet and Power Supply	$259.95	Radio Shack Extended Basic ROM	$ 74.95
Single Drive Cabinet with Power Supply	$ 79.95	Radio Shack Disk Basic ROM 1.1	$ 29.95
Double Drive Cabinet with Power Supply	$109.95	Screen Clean - Clears Up Video Distortion On Your Color Computer	$ 39.95
		Set of Eight 64K RAM Chips w Mod Instructions	$ 49.95

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Software

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FLEX™ OS-9™ Color Computer

AT LAST!! A FULL BLOWN DISASSEMBLER FOR THE COLOR COMPUTER

Computer Systems Consultants **SUPER SLEUTH** is a "Time Tested", reliable, **PROVEN** Disassembler that has gained acceptance through out the FLEX Community as an extremely **POWERFUL, INTERACTIVE,** Software Tool. Now, this powerful Disassembler has been converted to run on a **Standard 32K Color Computer** or TDP-100 System with a **Disk System.** The CoCo **SLEUTH** Software Package consists of 3 Programs; SLEUTH (the Disassembler), CHGNAM (used to globally Change Labels to a meaningful Name), and XREF (a Cross Reference Generator for Source Code Files). CoCo SLEUTH will Disassemble Disk Files of 6800, 6801, 6802, 6803 (the "Baby CoCo"), 6805, 6808, 6809, and 6502 (Apple, Atari, Commodore, etc.) Object Code if you can get it on a Color Computer Disk. (See Aug. '83 '68' Micro Journal "Color Users Notes" Column for a full Review.)
Color Computer Disk - Object Code Only $49.00

FORTH Programming Language

Steams Electronics FORTH — Intrigued by **Forth??** Here is a Forth package **tailored** to the **Color Computer!** This package is supplied on Tape, with instructions for transferring it to disk if you wish. Written primarily in machine language, it's **speed is unparalled.** A full Semigraphic-8 Editor is provided, along with "goodies" like Graphics and Sound Commands, Printer Commands, Auto-Repeat and Control Keys, etc. If you are interested in Learning Forth, a **Trace Feature** is provided which is invaluable. If you are a FORTH Pro, this package provides CPU carry Flag accessibility, Fast Task Multiplexing, Clean Interrupt Handling, etc. (Or; you won't "out grow" the **Basic** capabilities of this **Implementation**). Combine this package with Leo Brodie's **EXCELLENT** Book "Starting FORTH", and you will be a FORTH Expert before you know it (and have a lot of fun doing it!).

Color Computer TAPE (w/ instructions for transferring to Disk) $58.95

Color Computer **GRAPHIC SCREEN PRINT** Programs

Dumps any "PMODE" Screen to the Printer with the BASIC USR Function. Shift the Printout Left or Right or Reverse Print (Dark for Light Screen and Vice Versa). All Programs on Tape.

GSPR	for Radio Shack LP-VII/VIII & DMP 100/200/400 Printers	$7.95
GSPE	for Epson w/ Graftrax and Graftrax + Printers	9.95
GSPG	for Gemini 10 and 15 Printers	9.95
GSPP	for the Prowriter Printers	9.95

DATE-O-BASE CALENDAR Program

A Menu Driven **EXTENDED BASIC** Program which allows the entry of up to 12 **Memos** per Day, each of which may contain up to 28 Characters, for any day of the Month between the years 1700 and 2099. A **Graphic Calendar** shows which days contain **Memos,** and a "Key Word" Search is provided which can be output to the Screen or Printer.

TAPE DATE-O-BASE CALENDAR (Each Tape File will hold up to 400 Memos) $16.95
DISK DATE-O-BASE CALENDAR (4,000 Memos at 300/Month per Disk) 19.95

Interested in **INTEREST** (the Money Kind)?

An **EXTENDED BASIC** Program that will help you deal with numerous problems requiring interest calculations. Present Value, Rate of Return, Current Bond Yield and Rate of Return to maturity, Loan Repayment Amortization Scheduals, etc.
TAPE $29.95

Data Base Management System

DISK DATA HANDLER 64K - EXTENDED BASIC w/ Mach. Lang. Routines. Allows a max of 246 Chars. and 14 Fields per Record, and another Record can be linked to the first; 8 Char. Field Names, up to 99 Chars. per Field. Powerful On-Screen editor for input and update, flexible Output capabilities including output to Disk Files for use by other Programs. Change File Definition without re-entering the Data, Split Files, etc. Allows Multiple Field Sorts, Select on any combination of Fields, etc. An extremely POWERFUL **TOOL**; instructions provide examples of Mailing Lists and a Financial Stock Profit and Loss Tracking System.
DISK $54.95

ACCOUNTING

DISK DOUBLE ENTRY - DISK EXTENDED BASIC w/ Mach. Lang. Routines. A "Traditional" Accounting Package for Small Business, Clubs, Churches, Personal Use, etc. Up to four levels of subtotals with Trial Balance, Income Statement, and Balance Sheet Reports. DDE allows up to 300 accounts and a Trial Balance of $9,999,999.99. Transactions may be up to 14 lines long, and comments and explanations may be freely used. Accounts are traceable to the journal transaction, which may include comments. Screen reports allow review of past transactions and current balances. **DISK** $44.95

---- A full, screen oriented, **WORD PROCESSOR** ----

STYLOGRAPH 2.0 -- (now runs on the **Data-Comp** and **FHL Color FLEX Systems;** uses the 51 x 24 Display Screens). Full screen display and editing (i.e., what you see is what you get); supports the Daisy Wheel proportional printers.
SPECIAL Color **FLEX** STYLO $195.00; **FLEX** and **OS-9** STYLO $295.00; **UniFLEX** STYLO $395.00

Fast **SPELLING CHECKER** — allows directly changing the Text File, adding words to the dictionary, etc. 75,000 words in less than 400 sectors. **FLEX, Color FLEX, OS/9** $125.00 **UniFLEX** $175.00

MAIL MERGE — greatly extends the power and flexibility of STYLOGRAPH. Allows Multiple Text files to be printed out as one large document. Provides for merging information into the Text File during printing (such as different names and addresses), etc.
FLEX, Color FLEX, OS-9 $145.00 **UniFLEX** $195.00

DBMAG Data Base Management System — An XBASIC-based, Menu Driven, DBMS with "Built-In" Audit Tracking, Extremely Powerful Report & Format Capabilities, etc. This **Time Proven** DBMS will become the "Work Horse" of your Software Stable.
FLEX and **Color FLEX** $295.00 **UniFLEX** $395.00

Accts Rec., Accts Payable & Gen Ledger — A **FULL Accounting Package** that can be used together, or as separate packages; provides the IRS required Audit Tracking. (XBASIC, based on the "Osborne Business Programs.")
FLEX and Color FLEX $295.00/PROG UniFLEX $395.00/PROG

An **Electronic Spread Sheet**

DYNACALC — **THE Electronic Spread Sheet** for 6809 Computer Systems. An extremely POWERFUL Business Tool, this Program will find an unlimited number of "non-business" applications, also (for example, I have just finished setting up a Full Junior College Electronics Curriculum using **DYNACALC**). Advanced features like "Table Lookup" make Income Tax work easy; Column or Row Sorting for numerous applications; etc. Completely "Memory Resident", Machine Language, this Program is **FAST.** Provides STANDARD FLEX Text File output for use with BASIC, Word Processors, Pascal, %^@, etc.
FLEX and **SPECIAL Color FLEX** (Both Mfl. and Data-Comp) $200.00 **UniFLEX** $395.00

Machine Language DATA BASE MANAGEMENT System

Westchester Applied Business Systems **XDMS** Data Management Systems. Possibly one of the most powerful DMS's available, this machine language program is small enough to operate on a **single sided 5" disk,** yet provides the speed of M.L. and power limited only by the user's imagination. Supports Sequential, Hierarchial, and Random Access File Structures, and has Virtual Memory capabilities for those Giant Data Bases. Easy-to-use English Language Command Structure.
XDMS — **FLEX** and **Color FLEX** $179.95 XDMS + — **FLEX** and **Color FLEX** $250.00

UNIVERSAL DATA RESEARCH INC. —— Note: **ALL** Accounting and DBM Progs. **Require** FLEX and XBASIC
These are Time Tested programs from an old, established, software house; for **Color FLEX** Systems
Data Base Manager Part 1 - $40.95; **Data Base Manager Part 2** - $49.95
Church Contributions - $49.95 **Single Entry Gen Ledger** - $49.95 **Balanced Billing System** - $49.95

Intergrated Software for **Color FLEX**
A/C $99.95 **A/P** $99.95 **Gen Ledger** $189.00 **Inventory 2** $69.00 **Payroll** $99.95

FLEX and **UniFLEX** — Note: Requires **XBASIC** (FLEX) or **basic** (UniFLEX)

A/C - FLEX $295	UniFLEX $395	**A/R** - FLEX $295	UniFLEX $395
Gen Ledger - FLEX $295	UniFLEX $395	**Inventory 2** - FLEX $295	UniFLEX $395
Payroll - FLEX $295	UniFLEX $395	**DBM** - FLEX $350	UniFLEX $450

Please specify 5 or 8 inch disk when ordering all software!

Computer Systems Consultants **FLEX** XBASIC Programs

FULL SCREEN FORMS DISPLAY	**FLEX** and **Color FLEX** $50.00	**UniFLEX** $75.00
FULL SCREEN MAILING LIST	**FLEX** and **Color FLEX** $100.00	**UniFLEX** $110.00
FULL SCREEN INVENTORY/MRP	**FLEX** and **Color FLEX** $100.00	**UniFLEX** $150.00
TABULA RASA SPREADSHEET	**FLEX** and **Color FLEX** $100.00	**UniFLEX** $200.00

SPELLB "Computer Dictionary" —— **OVER 128,000 words!**

No more "Let your fingers do the walking through the Dictionary" while you are inputting Text with your favorite Editor or Word Processor. **SPELLB** is more than "another Spelling Checker"; it allows you to **look up a word** from within your Editor or Word Processor so that you **KNOW** it is right WHEN YOU TYPE IT IN with the **SPELCMD** Utility (which operates in the FLEX Utility Space). Yes, it ALSO allows you to check and update the Text after you are finished; along with allowing you to ADD WORDS to the Dictionary, "Flag" questionable words in the Text for evaluation later, "View a word in context" before changing or ignoring, etc. **SPELLB** first checks a "Common Word Dictionary", then the normal Dictionary, then a "Personal Word List", and finally, any "Special Word List" you may have specified. **SPELLB** also allows the use of **Small Disk Storage** systems.

FLEX and **Color FLEX** $129.95

JUST —— a Text Formatter

JUST, a Text Formatter developed by Ron Anderson, provides numerous features which make it a valuable addition to any FLEX Users Software Library. **JUST** is designed for formatting Text Output for **Dot Matrix Printers** and provides many unique features:
-Output the "Formatted" Text to the Display for format analysis and change.
-Output the "Formatted" Text to a Text File for use with the **supplied PRINT.CMD** for producing multiple copies of the Text on the Printer INCLUDING IMBEDDED PRINTER COMMANDS (this Utility is very useful at other times also, and worth the price of the program by itself).
-**"User Configurable"** for adapting to other Printers (comes set up for Epson MX-80 with Graftrax); provides for up to ten (10) imbedded "Printer Control Commands", such as Italics on and off, boldface on and off, etc.
-Automatic compensation for a "Double Width" printed line.
-Includes the normal line width, margin, indent, paragraph, space, vertical skip lines, page length, page numbering, centering, fill, justification, etc.
-Use with **ANY** Editor.
-Supplied with "Structured Source" (Windrush PL/9); easy to see the flow of the program.
FLEX and **Color FLEX** $49.95

SPECIAL!! SPECIAL!! SPECIAL!!

Star-Kits excellent **SPELL'N FIX Dictionary** and **WRITE 'N SPELL** Word Look Up Program IN ONE PACKAGE;
FLEX and **Color FLEX** Systems —— **BOTH for ONLY $150.00**
When these are gone; the price goes UP!! WAY UP!! ORDER NOW!!

Also, call for "More Info" on both the FLEX Based and Color Computer Based **STAR-Kits** Products; including the HUMBUG Monitor, Check 'N Tax Program, REMOTERM Color Computer External Terminal Program, etc.

PASCAL UTILITIES — Requires LUCIDATA Pascal ver 3.

XREF — produce a Cross Reference Listing of any text; oriented to Pascal Source.
INCLUDE — allows the inclusion of other Files in a Source Text; has unlimited nesting capabilities. Also allows Binary File inclusions.
PROFILER -- produces an Indented, Numbered, "Structogram" of a Pascal Source Text File. Allows viewing the overall structure of large programs, and provides clues as to the integrity of the program. Supplied as Source Code; requires compilation.
FLEX and **Color FLEX** — Each program $25.00

COPYCAT -- (Pascal **NOT** required) Allows reading TSC Mini-FLEX, SSB DOS68, and Digital Research CP/M Disks while operating under FLEX 1.0, FLEX 2.0, or FLEX 9.0 with 6800 or 6809 Systems. COPYCAT will not perform Miracles, but, between the program and the manual, you stand a good chance of accomplishing a transfer. Includes Utilities to List Directories, Copy Files, and convert Text Files when required. Also includes a Utility for investigating Physical Compatibility problems. Programs supplied in **Modular Source Code** to make it easier to solve unusual problems.
FLEX and **Color FLEX** 5" $50.00 **FLEX** 8" $65.00

O-F ---- OS/9 to FLEX - FLEX to OS/9 ----

Finally!! the barrier has been removed between **OS/9** and **FLEX** formatted disks! Now you can READ **from,** and WRITE **to,** a Single Sided 5" or 8" FLEX diskette from OS-9 with **O-F**. **O-F** is a new and unique program, written in **BASIC09** (**with** Source), that performs the following functions;
REFORMAT: A **BASIC09** Program that reformats a chosen amount of an **OS-9** disk to **FLEX** Format so it can be used normally by FLEX.
FLEX: A **BASIC09** Program that does the actual **read** or **write** function to the special **O-F Transfer Disk,** all selectable from a user-friendly menu. Functions provided include reading the FLEX Directory, Deleting FLEX Files, Copying both directions, etc. All selections are interactive and complete, including all necessary prompts to the operator.
FLEX users can read, write and use the special disk as any other FLEX disk, provided the FLEX directory is not allowed to continue beyond track zero (too many files).
FLEX and **Color FLEX** $79.95

COPYMULT.CMD ---- Copy **LARGE** Disks to **several smaller** disks ----

The following FLEX utilities allow the backup of **ANY size disk** to any **SMALLER** size diskettes (Winchester to 8's or 5's, 8" to 5's, etc.). By simply inserting diskettes as requested by **COPYMULT,** a large disk system may be downloaded to your present floppy disk system, any size. No need to fiddle with directory deletions or any of the other tedious operations that must be done using the normal copy routines.
COPYMULT.CMD understands normal "copy" syntax and always keeps up with files already copied by maintaining directories for both host and receiving disk system, eliminating hours of tedious keyboard entries and other time consuming cleanup chores.
BACKUP.CMD is a special program that downloads "random" type files, any size.
RESTORE.CMD a special program to restructure copied "random" files for copying, or recopying back to the host system.
FREELINK.CMD a "bonus" utility that "relinks" the free chain of floppy or hard disk thereby eliminating fragmentation.
Completely documented source files included. ALL 4 Programs $99.50 (8" or 5")

CHESS 6809

Requires FLEX and DISPLAYS **On Any Type Terminal**

Features:
*Two display boards. *Change skill level. *Swap side. *Point scoring system.
*Four levels of play. *Solve Checkmate problems in 1-2-3-4 moves.
*Make move and swap sides. *Play white or black.

This is one of the **strongest** CHESS programs running on any microcomputer, estimated USCF Rating 1600+ (better than most 'club' players at higher levels).
FLEX and **Color FLEX** $79.95

DIET-TRAC Forecaster

DIET-TRAC Forecaster is an XBASIC program that plans a diet in terms of either calories and percentage of carbohydrates, proteins and fats (C P G%) or grams of Carbohydrate. Protein and Fat food exchanges of each of the six basic food groups (vegetable, bread, meat, skim milk, fruit and fat) for a specific individual.
Sex, Age, Height, Present Weight, Frame Size, Activity Level and Basal Metabolic Rate for normal individual are taken into account. Ideal weight and sustaining calories for any weight of the above individual are calculated. When a weight goal is given (either gain or loss), and a calorie plan is agreed upon between the computer and the individual, the number of days to reach the weight goal is projected. The starting and ending rate of weight loss is calculated, and a daily calendar with each day's weight for a 30-day period is printed.
FLEX - $59.95 **UniFLEX** - $89.95

XDATA ---- A **COMMUNICATION** Package for the **UniFLEX** Operating System ----

Allows **UniFLEX Based Systems** to Transmit and Receive files to and from other Computer Systems via Modem. Use with CP/M, Main Frames, other UniFLEX Systems, etc.
-- Verifies Transmission Integrity using checksum or CRC
-- Automatically Re-Transmits bad blocks
-- Transmits data in 128 byte blocks
UniFLEX $299.99

---- **DISASSEMBLERS** ----

Super Sleuth -- Powerful, INTERACTIVE, Disassembler; provides Hex/ASCII Screen Dump of Memory Blocks or Disk Files for easy Examine/Change, Area Definitions; X-REF Generator of Source Code; change Address Labels to **Names;** etc. **Disassembles** 6800/1/2/3/5/8/9 and 6502 Code.
Color FLEX Obj. Only $50.00, w/source $99.00; **FLEX** $99.00; **UniFLEX** $100.00; **OS-9** $100.00

DYNAMITE + -- An "easy to use" 6809 Disassembler for use w/ Disk Files, (will also disassemble 6800 Code). Develop a "Control File" of Area Definitions during successive **disassemblies;** X-Ref Source Files; replace Hex locations with Label Names; etc. Label Files provided for Mini-FLEX, FLEX2, FLEX9, Color Computer FLEX. **FLEX** and **Color FLEX** $100.00 **OS-9** $150.00 **UniFLEX** $300.00

---- **ASSEMBLERS** ----

TSC Macro Assembler — the FLEX **STANDARD** Assembler **FLEX** and **Color FLEX** $50.00
TSC Reloc. Asmb./Link. Load. — Need for many of the C and Pascal Comp. **FLEX** & **Color FLEX** $150.00

RSMAC -- **Relocating, Recursive-Macro Assembler** and **Linking Loader** for the 6809. Use either standard **Motorola** Format or **Special** Ed Smith Format. Supports Recursive Macros, Conditional Assembly, etc. Opt. X-Ref Listing; Includes a Small Line-oriented Editor as part of the Assembler. Greatly improved operating manual. **FLEX** and **Color FLEX 6809 RSMAC** w/Link and Editor $150.00 w/Source, add $50.00

OmegaSoft Relocatable Assembler and **Linking Loader** — 2-pass Reloc. Asmb; 2-pass Link. Load. Supports 6 Char. Labels, System Calls (SWI[x] PCB x), Expressions with Arith., Logic, and Shifts, etc.
#RALL1 **FLEX** and **Color FLEX** $125.00 (one year Maint. $50.00)

MACE -- (by Graham Trott) from **WINDRUSH MICRO SYSTEMS.** A combined Editor/Assembler designed to allow the Programmer to Enter, Edit, and Assemble Programs with a minimum of effort, w/o leaving the Program. **XMACE** is a **Cross Assembler** for the MC6800/1/3 and Hitachi HD6301 (CMOS 6801) with the same functions and features as MACE.
FLEX and **Color FLEX** - $95.00

---- A **UniFLEX** "basic" **De-Compiler** ----

DUB -- Re-Creates a Source Listing from **UniFLEX** Compiled BASIC Programs. Easy to Use; works w/ **ALL** Versions of UniFLEX basic; Output to Disk or Term. Time **TESTED** and **PROVEN;** SOLID! **UniFLEX** $219.95

---- **COMPILERS** ----

PL/9 — (by Graham Trott) from **WINDRUSH MICRO SYSTEMS.** A "Structured" Assembly Language Editor/**Compiler**/Debugger, all in **ONE PACKAGE;** provides a totally **INTERACTIVE** Program Development Cycle. The Compiler supports Large Symbol Names, Variable Types, Pointers, Control Structures, Stack, A-,B-, and D-Register manipulation, etc. The Source oriented Trace/Debugger provides Single Stepping, Breakpointing, etc. An excellent Software Development Tool for utilizing the power of the 6809.
FLEX and **Color FLEX** - $190.00

C -- (By James McCosh) from **WINDRUSH MICRO SYSTEMS.** SUPER C Compiler for the FLEX Operating System. Needs the TSC Relocating Assembler/Linking Loader for those "full blown" System Packages.
FLEX and **Color FLEX** - 295.00

Introl 6809 "C" Compiler; generates very efficient object code. Output "benchmarks" close to 12MHz 68000 in 8 Bit Operations; 1.5 times faster than a 4 MHz Z80 when using a 2MHz 6809 System (Re. p 43, "68" Micro Journal, May '83). Floats, etc. **FLEX, Color FLEX, OS/9** $375.00 **UniFLEX** $425.00

---- **PASCAL** ----

TSC PASCAL — Native Code Compiler (UCSD Oriented). **FLEX** and **Color FLEX** $200.00

Lucidata PASCAL — P-Code Compiler (ISO Standard). Designed especially for Microcomputer Systems; Run-time System checks available resources for each task, allowing operation on even minimal computer systems. Allows linkage to Assembler Code for maximum flexibility.
FLEX and **Color FLEX** 5" $190.00 **FLEX** 8" $205.00

OmegaSoft PASCAL -- For the **PROFESSIONAL;** ISO Based, Native Code Compiler. For Real-Time and Process Control applications. Use custom I/O devices in place of the Pascal INPUT and OUTPUT; Long Int. (32 Bit); Dynamic length strings; Interrupt Processing, ROM-able, PIC, Re-Entrant Code, etc. POTENT!! **Includes** Source for the Symbolic Debugger, Runtime, and several Utilities. Requires a "Motorola Compatible" Relocating Assembler and Linking Loader.
#PCS2 **FLEX** and **Color FLEX** $425.00 (one year Maint. $100)

DYNASHARE —— Multi-User, Multi-Tasking with **FLEX**

Southeast Media is now shipping DYNASHARE **FROM STOCK** - the multi-user, multi-tasking capability of **DYNASHARE** allows FLEX users the **advantages** of more sophisticated and time saving computer usage without having to buy or learn a new Language or Operating System syntax. **DYNASHARE,** as its name implies, allows true "time-sharing" operation under the popular FLEX Operating System, and also allows each user to run two simultaneous jobs (multi-tasking); even on single-user systems. For example, while in EDIT, you can list another file or examine a directory. Or, you might look up an item in a Data Base while a Sort is in progress! **DYNASHARE** also provides some fringe benefits that will be greatly appreciated by FLEX users, including type-ahead, command line editing, and instant response to "escape".
DYNASHARE is the painless method! Use your existing Flex computer by simply adding 64K of RAM for each user. Fact is, you still use FLEX just like you always have! **DYNASHARE** is not intended as competition to UniFLEX. It does not improve on the speed of FLEX, and does not offer password protection or other niceties of a full-blown multi-user system. What **DYNASHARE does do** is give FLEX users a **low-cost way to use existing software in a multi-user, multi-tasking environment,** so your existing FLEX versions of BASIC, XBASIC, editors, assemblers, disassemblers, sort/merge packages, word processors, compilers, DYNACALC spread-sheet package, and so on are still good.
NOTE -- The **initial release** of DYNASHARE is for **SWTPC 8/09** Computers, but versions will also be available for other popular extended-memory (up to **128K**) systems, such as XELIX and GIMIX. A minimum of **128K** of **RAM** will be required with **ALL** versions. **DYNASHARE** requires **64k of RAM for each active task;** thus a 256k system could allow foreground-background operation on two terminals, or foreground-only operation on four terminals. **AVAILABLE NOW** from **SOUTHEAST MEDIA** —— $200.00

—— **AUTHORS - PROGRAMMERS** ——— **QUALITY SOFTWARE NEEDED** ——
FLEX - UniFLEX - OS/9 - Color Computer

For the past several months, we at the **Southeast Media Division** of **Computer Publishing, Inc.** (CPI), the parent company of **'68' MICRO JOURNAL** and **COLOR MICRO JOURNAL,** have debated expanding our software distribution business. Many other magazines have been doing so for years (in fact, MOST were in the Software Distribution Business BEFORE they began to publish a Magazine). Presently there are many fine **examples of software** that has been developed by YOU, our readers, that will never **see** the "light of day" due to the cost of Advertising and TIME and cost involved in the production, distribution, and Customer SUPPORT of that software unless **SOMEONE,** with enough exposure and the willingness to continually advertise, runs with the ball.

Software is the "backbone" for the REAL utilization of any Computer System, and ours are no exception! This has been no simple decision. While we realize that there could be some conflict with some of our advertisers, we ALSO hear a LOUD and CONTINUOUS cry for **HELP** from our Readers. From day one, the **foremost** concern of '68' MICRO JOURNAL has been it's **READERS!** Therefore, our **Southeast Media Division** will accept, for appraisal for possible Distribution, 6809 software; Games, Utilities, Software Development, Business Application Programs, etc.

In the past there has been too **much** software offered that was not quite ready. We will strive to eliminate that element. But, right up front, we tell you only that we will do our very best; nothing more. Also, we will strive to keep cost to a bare minimum, while securing for the author a fair return in royalty payments, promptly paid, and in customer support for his product.

Of course, we will expect, no -- **DEMAND,** that the author keep the product free of errors (bugs), and maintain it in a prompt and business like manner. Also we shall require that authors be willing to furnish 'source' for those programs that justify, by price and utility, inclusion of same. The lack of source code, properly commented, is a continual complaint we hear. Not all programs will be sold with source, but where necessary, we will insist that it be included.

In **some** instances the program may be small or short and not justify itself as a "single" sale product. In this event it will be combined with other like programs, and offered as a package. In that event, the royalties will be split between the various authors.

If you have software that you feel will qualify under this program, please contact one of the people below. Remember, if your software has any problems or "funnies" — **GET IT STRAIGHT BEFORE YOU CONTACT US!!** Also get your source code in proper shape and well commented; there is too much 99% code already drifting around.

If your software is **READY** contact: **Bob May,** Don Williams, or Tom Williams

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contents, provides listing controls such as a pause when the Screen is full, etc. It also provides much more flexible Commands; for example, if you enter **CAT .TXT** it will display a Disk Catalog of the Files with a ".TXT" Extension ONLY, or if you enter **COPY Ø 1 .TXT** it will copy ALL of the Files from the Disk in Drive Ø to Drive 1 that have a ".TXT" Extension, etc. Like the Radio Shack Operating System, FLEX is strictly a Single User Operating System.

The **OS-9 Operating System**, on the other hand, has Multi-User (several Users can use the same Computer at the same time) and Multi-Tasking (more than one Program can be run at the same time) capabilities. OS-9 and the 6809 Computer Chip provide the most powerful 8-bit Computer Operating System available **anywhere**. We noted that the Radio Shack Operating System was ROM Based, and that FLEX was Disk Based; the OS-9 Operating System, in general, can be EITHER (or even Tape Based, for that matter, but the use of the Microcomputer Tape Systems would severely restrict its capabilities). Where the RS and FLEX Operating Systems are fixed in memory, OS-9 can live ANYWHERE. Where the RS and FLEX Operating Systems are effectively each a single program, OS-9 is made up of several **MODULES**; portions of programs that are linked together. It can be used with a few modules (for example, in a Traffic Light Controller), or with numerous modules (for example, as is used in the GIMIX III Computer System with "smart" I/O Ports, Dynamic Address Translation for use with up to a Meg of Memory, 5", 8", and Hard Disks, Serial and Parallel Printers, numerous Terminals, etc., all in the same System). But, with this Power and Flexibility, it is actually an EASY Operating System to learn and use.

The OS-9 System that is available from Radio Shack for the Color Computer is the **OS-9 Level I Disk Operating System**. While Level I OS-9 **will** support Multi-User operation, it is somewhat restricted due to lack of Memory (it can only use 64K); and the limitations of the Color Computer (after all, you do not have a $5,ØØØ Computer System) make the Multi-User capability even more restrictive. There are actually two limitations in the Color Computer; the use of PIA's and Software to obtain Serial Data Transfer, and the requirement that the Interrupts must be disabled during Disk Operations. The Software driven Serial port will make it very difficult to allow a Terminal, for use by a second User, to talk back and forth with OS-9 when connected to the Serial port of the Color Computer (but a Printer works FINE); the only problems that shutting off the Interrupts during Disk accesses cause is that the "Clock" is shut off during that time, so will run a little slow, and you lose the Keyboard when a Disk is being accessed (which makes it a little hard to run a Printer Listing of a Disk File as a "background task" while you are using an Editor or Word Processor). Other than these two minor problems, I can see very little difference between the operation of OS-9 on the Color Computer or on the larger SS-5Ø Bus Systems. The more you use OS-9, the more you will grow to love it.

Continued next Month

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WHERE IS THE COMPUTER NOW ? ?

Where, Oh Where, Has My COCO Gone?
or
Somewhere Over The Rainbow
or
Lost In Space
or
The Black Hole

When working with computers, such as the TRS-8Ø Color Computer, without front-panel displays, it is often very difficult to know what the computer is doing. There are no blinking lights to indicate activity on the address and data busses. Without some assistance, it is often impossible to determine whether the COCO is not operational or is simply in some long internal computational or table-searching sequence.

My first encounter with the problem occured several years ago while running extensive memory tests on a computer with elusive problems. I did not want to sit at the terminal staring at the screen for hours waiting for the memory test to output diagnostic messages. I placed an AM radio tuned to one of the RFI emission bands on the top of the computer while it was being tested. Since the memory test was so repetitive, it sounded like a metronome. Any break in the audible pattern indicated a problem detected by the test program. This technique may be used with the older COCO's, but the newer ones have significantly less RFI, and is not as effective.

Soon afterward, an article appeared in BYTE Magazine describing a simple circuit which allowed an oscilloscope to be used to monitor address bus activity. The high-order eight bits of the address bus are connected to a digital to analog converter, and the low-order eight bits are connected to another digital to analog converter. One converter is connected to the horizontal input of the oscilloscope, and the other is connected to the vertical input, providing an X-Y display of the activity. The display shows address bus activity (or lack thereof) dramatically. Unfortunately, the display changes so rapidly that it is very difficult to see patterns in the addresses. It is also not possible to relate the display directly to addresses. Also, this method requires the use of an oscilloscope, which is more costly and usually more bulky than the COCO itself.

Another approach often used on older computers of all sizes is to simply provide a LED display for all address lines and/or data lines on the bus. This method also shows bus activity, and has the additional advantages of being cheaper and more portable than the oscilloscope method. It has the disadvantage of providing a display which is often changing so fast that it is not possible to see patterns in it.

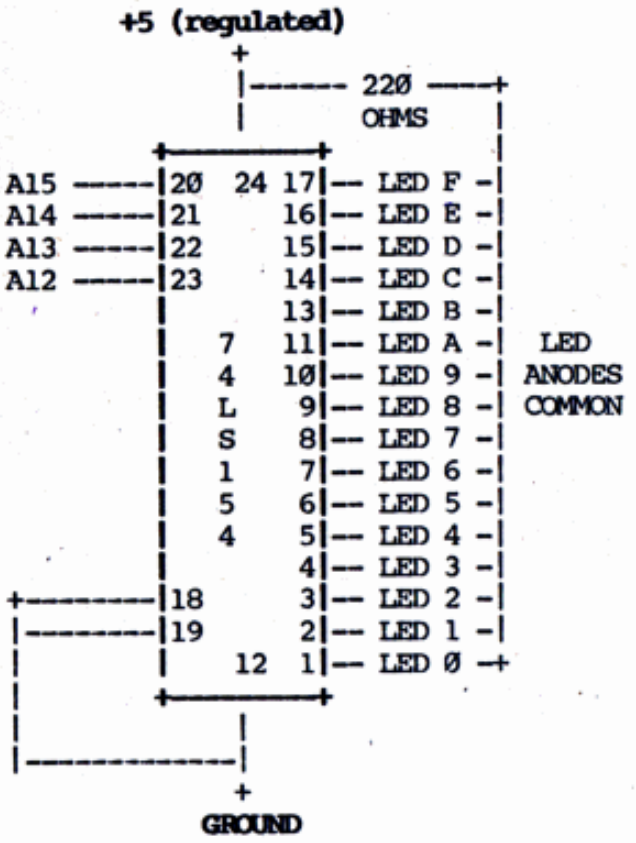
To provide a display better suited to pattern recognition, I built the circuit below, which uses a TTL chip (74LS154) providing a one of sixteen output for any combination of four inputs. The four input lines are attached to the four high-order address lines. After this display is attached to the computer, the user will quickly begin to recognize normal and abnormal patterns. Since the sixteen LED's display the leading hex digit on the address lines, the changes among the lights will be vastly slower than in the one-to-one case. A seven-segment hex display would not work, since it will usually read '8', because the addresses normally change too fast to detect with the eye.

Actually installing this circuit into a COCO is reasonably simple. Individual LED's are usable, as are bar-graph LED's (available at Radio Shack), as long as they are of the separate anode and cathode or the common anode varieties. Because the loading factors are small, the circuit could be wire-wrapped on a small section of perf-board and point-to-point wired for power, ground, and address lines. The power, ground, and address lines could be picked up by tacking SHORT wire-wrap lines directly to the appropriate pins on the 6884 or on the 6809.

The LED's or bar-graph units may be readily mounted on the cover just above the keyboard by boring holes in the plastic, and then filing away the plastic, as necessary for the bar-graphs. The LED's should be labelled Ø-9 and A-F in sequence from left to right. Press-on letters are available from many bookstores for a professional look. Since the bar-graphs come with ten LED's each, the extra four lines could be used as power indicators or could be buffered and used to indicate

other bus line logic levels.

A useful additional application of the display is as a debugging tool. Temporarily attaching a diode from one of the output pins on the 74LS154 to the NMI pin on the 6809 will generate an interrupt whenever any address in that range is generated. Of course, the user must provide an interrupt-handling routine and place its address into the SAM NMI vector register for this technique to work.



by **E. M. (Bud) Pass**, Ph.D.
Computer Systems Consultants, Inc.
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BASLIST/BAS

As now written, this program allows user selection of the LEFT MARGIN, and will automatically indent the wrap around portion of a line properly, for line numbers of up to 5 digits. Also the number of wrap around lines is unlimited, depending only on the length of a line permitted by BASIC. It does come into play, however, for large left margins. The Margin may be changed to suit by altering 'X' in line 560.

I am using an OKIDATA 83A printer. CHR$(30) prints the normal 10 C.P.I. while CHR$(29); CHR$(31) prints Bold Type.

```
SEPTEMBER 23 1983      TRS-80 COLOR COMPUTER          BASLIST/BAS
JOHN H. DEAL               DISK NO. 1000              PAGE NO.  1


100 POKE 149,0:POKE 150,41:REM .. SETS 1200 BAUD
110 REM .. THIS PROGRAM CALLED ' B A S L I S T ' AND LISTS A BASIC
    PROGRAM SAVED IN ASCII CODE. IT WILL ALLOW SETTING A LEFT MARGIN, AND
    WILL INDENT THE WRAP AROUND PORTION OF A LINE 1 SPACE PLUS THE NUMBER OF
    DIGITS IN THE LINE NUMBER.
120 REM *****  *****  *****
130 REM .. THE PROGRAM TO BE LISTED MUST HAVE BEEN SAVED USING THE 'A'
    FORMAT.
140 CLEAR 1000:CLS
150 INPUT"WHAT IS THE NAME OF THE BASIC PROGRAM. AS (BASLIST)";N$:PRINT
160 INPUT"ENTER TODAYS DATE. AS (SEPTEMBER 18 1983)";D$:PRINT
170 INPUT"WHAT IS THE DISK NUMBER. AS (1000)";D:PRINT
180 INPUT"WHAT LEFT MARGIN. AS (4)";X
190 K$=N$:N$=N$+"/BAS":PRINT
200 C=0:P=1:GOSUB 320:PRINT
210 OPEN "I",#1,N$
220 IF EOF(1)=-1 THEN 300
230 LINE INPUT #1,L$
240 FOR N=2 TO 6:IF MID$(L$,N,1)()" " THEN NEXT N
250 L1=N
260 IF LEN(L$))(80-X) THEN GOSUB 400:GOTO 280
270 PRINT #-2,TAB(X);L$
280 C=C+1:IF C=58 THEN PRINT #-2,CHR$(12):P=P+1:C=0:IF EOF(1)()-1 THEN
    GOSUB 320 ELSE 300
290 GOTO 220
300 CLOSE #1:END
310 REM *****  *****  *****
320 REM .. SUBROUTINE TO PRINT HEADING AND SET BOLD PRINT.
330 CLS
340 PRINT #-2,TAB(X);D$;TAB(32-X);"TRS-80 COLOR COMPUTER";CHR$(29);
    CHR$(31);
350 PRINT #-2,TAB(60-X);K$;CHR$(30);"/BAS"
360 PRINT #-2,TAB(X);"JOHN H. DEAL";TAB(36-X);"DISK NO.
    ";D;TAB(63-X);"PAGE NO. ";P
370 PRINT #-2:PRINT #-2:IF P)1 THEN PRINT #-2
380 C=0:RETURN
390 REM *****  *****  *****
400 REM .. SUBROUTINE TO INDENT A WRAP AROUND LINE.
410 GOSUB 490
420 PRINT #-2,TAB(X);L1$:C=C+1
430 L2$=RIGHT$(L$,(LEN(L$)-LEN(L1$)))
440 IF LEN(L2$))(80-X) THEN L$=L2$:GOSUB 490:GOTO 460
450 IF LEN(L2$)(=(80-X) THEN 470
460 PRINT #-2,TAB(L1+X);L1$:C=C+1:GOTO 430
470 PRINT #-2,TAB(L1+X);L2$:C=C+1
480 RETURN
490 FOR J=1 TO 20
500 L1$=LEFT$(L$,((80-X)-J))
510 IF RIGHT$(L1$,1)()" " THEN 520 ELSE 530
520 NEXT J
530 RETURN
```

by
John H. Deal

XDMS

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The XDMS Data Management System is available in three levels. Each level includes the XDMS nucleus, VMGEN utility and System Documentation for level III. XDMS is one of the most powerful systems available for 6809 computers and may be used for a wide variety of applications. XDMS users are registered in our database to permit distribution of product announcements and validation of user upgrades and maintenance requests.

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This service, with updates, will allow you who are wary or confused by the various claims of compiler vendors, an opportunity to review comparisons, comments, benchmarks, etc., concerning the many different compilers on the market, for the 6809 micro-computer. Thus the savings could far offset the small cost of this service.

Many have purchased compilers and then discovered that the particular compiler purchased either is not the most efficient for their purposes or does not contain features necessary for their application. Thus the added expense of purchasing additional compiler(s) or not being able to fully utilize the advantages of high level language compilers becomes too expensive.

The following COMPILERS are reviewed initially, more will be reviewed, compared and bench-marked as they become available to the author:

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REVIEW

RDC-1
DISK CONTROLLER

F & D Associates RDC-1
1210 Todd Road
New Plymouth, OH 45654
(614) 592-5721

The **F&D RDC-1** Disk Controller Board for the Color Computer is an EXCELLENT example of "later technology" over the Radio Shack Disk Controller. One of the weak points in the RS Disk Controller is the omission of a precision Data Separator (evidently to hold the price down); see "Why CoCo can't Read", **CMJ**, Sept. '83. The other problem that has been persistent with the RS Disk Controller is the intermittent operation after the Controller has been in use a while, which is caused by corrosion due to the dissimilar metals in the ROM Slot Connector and the PC Board Edge Connector. The **RDC-1G** eliminates BOTH of the problems, and with a much LOWER parts count. It also provides flexibility in providing jumpers for the use of other Controller Chips, such as the 1797, and/or ROMs, such as the F & D **FADBUG-C**.

The **RDC-1** is NOT available from F & D as a complete unit, or even as a complete PARTS KIT. The **RDC-1** includes the bare PC Board, documentation, and a 9216B Data Separator Chip for **$49.95**; while the **RDC-1G** is the same thing with **Gold Plating** on the PC Board Edge Connector for **$54.50**. They also have available the Radio Shack **Disk Basic ROM** for **$35.00**, a case for the Controller for **$7.50**, the **FADBUG-C** Monitor for this Controller for **$25.00**, and a 1793 Disk Controller Chip for **$32.00**.

The packages and documentation are oriented towards the advanced hobbyist or industrial user who would normally have a lot of the required parts laying around, and would have no problem with the Documentation (which is oriented towards those with electronics experience). You should end up with **LESS than $150** in the whole Controller, even if you purchase everything including Sockets.

Once the parts are rounded up, it will take less than a couple of hours to assemble the Controller, and since there are no adjustments, it SHOULD work the first try (ours did). While there is plenty of room on the Board so that the work is not at all tedious, this DOES assume some experience in Digital Electronics Assembly and Soldering Techniques.

Our **RDC-1** worked with no problems until we tried formatting a disk under CoCo OS-9; it would write all of the Tracks, but the Drive would not return to Track 0 to Verify the Format. Investigation by **F & D** revealed that the the problem was in the standard **WD1793 Controller Chip** that we used; the SOLUTION was to use the **Radio Shack** version of the 1793, which is not made by Western Digital. (As a side comment, the only problem WE have had with the CoCo OS-9 has been in **formatting** a disk, and we have tried NUMEROUS Disks, Drives, and Controllers. It just acts like the overall timing is cutting things TOO close. Once you get a disk formatted, everything works like a champ.)

The **RDC-1** makes use of the new **SMC9216B Data Separator Chip**, which eliminates all adjustments and is less expensive than the popular chip sets normally used. The Board is the same size as the Radio Shack unit, and, with the Radio Shack Disk Basic ROM installed, is **TOTALLY** compatible with the normal Radio Shack Disk Systems. Installation of the FADBUG-C ROM will allow the FLEX Disk Operating System to be run WITHOUT RS Extended BASIC or Disk BASIC. Also, jumpers are provided for the installation of 28 pin EPROMs, allowing the use of 2716 through 27128 chips (2K thru 16K EPROMs). Jumpers are also provided for determining the Side Select connector pin number, the installation of a 1797 Chip, applying the Color Computer "CART" Line to pin 18 or 20 of the ROM, to connect the Cartridge Slot pins 7 and 8 together to enable the "automatic takeover" when a Cartridge is installed, etc.

The following parts list for the **RDC-1** is provided so that you can begin rounding up the parts, estimating cost, etc.

INTEGRATED CIRCUITS
- 1 74LS163 Counter
- 1 74LS74 Dual-D Flipflop
- 1 74LS195 Counter
- 2 74LS06 Open Col. Drivers
- 1 74LS00 Quad NAND Gate
- 2 74LS04 Hex Inverters
- 1 74LS174 Hex D Latch
- 1 74LS02 Quad NOR Gate
- 1 74LS32 Quad OR Gate
- 1 SMC FDC9216B Data Separator (Supplied w/ **RDC-1**)
- 1 1793 or 1797 FDC Chip (1793 required for CoCo)
- 1 ROM or EPROM (use RS Disk Basic for CoCo)

RESISTORS
- 4 150 ohm 1/4 watt 5%
- 2 1000 ohm 1/4 watt 5%
- 3 4700 ohm 1/4 watt 5%
- 3 10K ohm 1/4 watt 5%

CAPACITORS
- 1 4.7 mfd 15wvdc Tantalum
- 7 .1 mfd 12v Disc
- 1 100 pf Disc

MISC. PARTS
- 1 PC Board (Supplied w/ **RDC-1**)
- 1 8 Mhz Crystal

(optional items)
- 1 Dual Row Header for jumpers
- ? "Mini Jump" programming plugs (like those used in the CoCo)
- 1 plastic Controller Case
- 1 8 pin socket
- 8 14 pin sockets
- 3 16 pin sockets
- 1 24 or 28 pin socket (for ROM)
- 1 40 pin socket

The **F & D Associates RDC-1** is an EXCELLENT Disk Controller option for the Radio Shack **Color Computer**, providing RELIABLE Operation with a low parts count and **NO** adjustments (which means that as long as the Crystal is in tolerance, it should work with no problem). While it DOES require a little Electronics experience to assemble, it is NOT out of reach of most "hardware hackers" (if you don't have the experience, you probably have

a friend that CAN assemble it); and the price is unbeatable!

PS

For those that are not regular **'68' Micro Journal** readers, **F & D Associates** has been producing Disk Controllers and Accessories for the SS-5Ø Bus Computer Systems for a few years, so are not "new to the business". They will be there if you have a problem.

CMJ Staff

OOPS!!

MICROBOOKS CLARIFICATION

In the discussion of the trial and error setting the of DIM and CLEAR Statements in the discussion of the **MICROBOOKS** Program in the Nov. '83 Issue of **Color Micro Journal**, I stated that I averaged about 2Ø Bytes per entry in my use of the Program, and that 25 Bytes would be a **useable** size to set in this method. Somehow, the word **"useable"** got PRINTED as **"UNuseable"**. Obviously, there is a small difference in the two words.

No entry size is **un**useable if you balance the DIM size to the CLEAR size. In rough figures, the DIM size times the **expected entry** size should equal the CLEAR size. If the number of Bytes per entry turns out to be greater, the DIM size will necessarily need to be smaller.

Continuing the discussion, the article suggests that after adjusting DIM and CLEAR sizes, if you do not get an "OM ERROR", you should use "PRINTMEM" to see if you still have enough memory left over to put to use (in the DIM and CLEAR Statements). This **would** be the case if the sizes were **too SMALL**. Somehow, it came out talking about putting the **program** to use, **NOT** the **left over memory**.

Jim LaLone

Thanks, Jim, for the clarification. In going over his ORIGINAL Manuscript, we note that the "un" was **NOT** in front of the "useable"; STUPID COMPUTER! In other words, **WE** blew it, not Jim. This is why we request, WHENEVER **POSSIBLE**, that the discussion supporting a Program be in **SOME** kind of an **ASCII** Format, such as Radio Shack **/DAT** File, FLEX **.TXT** File, or OS-9 Format. That way, we can transfer it DIRECTLY to the Word Processor, eliminating these kinds of problems. A BASIC Program is "no sweat", because we can save it in ASCII Format, **",A"**, and then transfer it directly, so any RS BASIC Programs are "pure", but the discussions with them give us some trouble. The "FINAL TEST" in the submission Format is "Can you read the Article with a "LINEINPUT A$" Statement and Print it back out to the Screen or Printer with a "PRINT A$" "; if so, we can handle it on this end.

Sorry for the slip-up.

RLN, Editor

X-Y PLOTS with the *MX80* in Basic09

Are you a business analyst, engineer, scientist, or a student of statistics? If so, this **Basic09 GRAF Procedure** could just possibly save you a lot of work! In the past there has been many a time when I wished for an easier way to plot regression analysis equations. Prior to writing the GRAF procedure, the plotting of equations was a luxury that I often passed up due to the number of calculations required for a chart of respectable resolution. Now, I can generate a chart in less than two minutes. Take for example the chart in **Example 1.** This chart has as its X Axis numbers that represents my home gas bills, by month, over two years. With this chart I can visualize when and how much natural gas we use at my house.

The **"GRAF** Procedure" is written in the BASIC09 language from Microware. BASIC09 is a very powerful and relatively easy to use language which operates under the **OS-9 Operating System** (also by Microware), which adds considerable power the language. However, with the right motivation and skill, one could convert this procedure to run under almost any BASIC or PASCAL language.

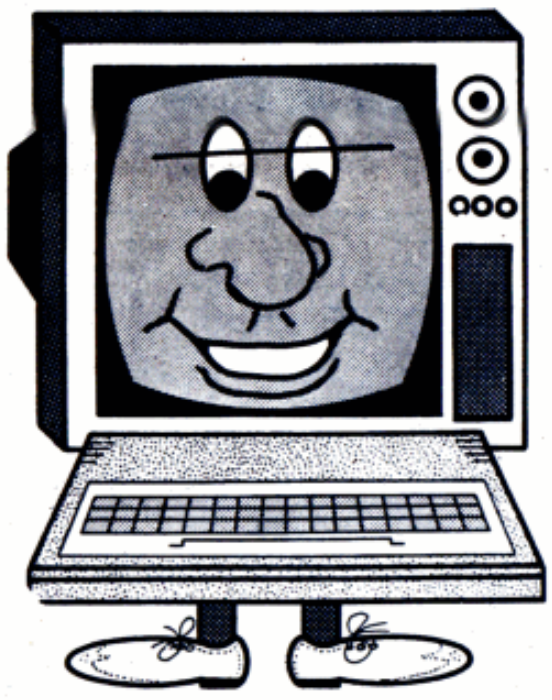
The graphic output is generated on a **Epson MX8Ø Printer** with the **GRAFTRAX 8Ø** ROMs installed. This printer, I also found, was easy to control.

The code, as presented here, operates as a subroutine. However, it could easily be modified to operate as a main procedure where the parameters are requested via the CRT.

The formulas that **GRAF** can plot are:

1. First degree linear equations of the form Y = a + bX
2. Second degree curvilinear equations of the form Y = a + bX + cX*X
3. Geometric equations of the form Y = ab**X

In addition to plotting the line based upon the equation selected, this procedure will also plot up to **5Ø discrete points.** This feature was added so that I could plot a selected regression formula along with the sample points that were used to



QUESTION

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establish the formula. With this feature I could visualize the "goodness of fit" of the equation.

The range that the plot extends along both the X and Y axes is set via an input parameter. This scale parameter is used to establish the sizes of the X and Y axes scale divisions. There are always six X axis divisions and five Y axis divisions. The absolute size of these divisions does not change. It is only the scale represented by these divisions that is modified for each chart.

When constructing a chart by the manual method, you would normally draw the X and Y axes along with their respective scales. Then you would plot a number of points per the selected equation. Finally, you label the chart. This approach cannot be used with most microcomputers for two reasons. First, most printers cannot feed the paper in two directions. Thus, Multiple passes are impossible. Second, to generate the entire chart in RAM memory and then dump to the printer requires a minimum of 6K bytes just for the body of the chart. In addition, the code to access this 6K byte array would be fairly complex since it would need to address each bit individually.

The MX80 printer generates characters that use a nine by five dot matrix. The bottom row of dots is only used for descenders and block graphics. These characters are printed on lines with a vertical spacing of twelve dots. Thus, there are three dots between each line of characters as a minimum. The MX80 BIT IMAGE GRAPHICS Modes can only address the top eight wires in its nine wire print head, limiting the number of rows that can be printed in one 'line' to eight. Strictly speaking, this is not a hardware limitation, but a limitation imposed by the size of a byte. The chart body generation can then only be accomplished eight rows at a time. As an alternative approach, you could have the body of the graph generated by using only one wire in the print head. By doing so you would then need to generate eight times as many 'lines'. Also, you would need to generate your own character set, since the MX80 could no longer print the Y axis scale. Since we want to print the Y axis scale as well as the body of the chart in one pass, we need to make the line spacing equal to eight dots plus limit the printing of characters for the Y axis to upper case only. This last limitation is really of no consequence since the data used in the Y axis scale is all numeric.

There are two basic BIT IMAGE GRAPHICS modes available in the MX80 with CRAFTRAX-80. One of these modes provides 480 dots per line and the other provides 960 dots per line. The 480 dots per line mode is the one I have chosen since it provides more than enough resolution for generating charts. Also, this mode puts less of a burden on the communications port to the printer. When using the BIT IMAGE GRAPHICS modes the following table is used.

PRINT HEAD DOT PATTERN	VALUE	POWER OF 2
Ø (TOP)	128	7
Ø	64	6
Ø	32	5
Ø	16	4
Ø	8	3
Ø	4	2
Ø	2	1
Ø	1	Ø
Ø (BOTTOM)	N/A	N/A

For instance, the top dot is activated by sending the value of 128 to the printer, or the lowest addressable dot by sending a 1. These values can be summed. Thus, a value of 255 will activate all eight of the addressable dots in the print head. You will notice that the value associated with each addressable dot is a power of two.

The approach that I have found to work well considering printer capabilities, memory size, and program complexity was to generate the points for one line at a time. Each line actually consists of 1920 dots. These 1920 dots are made up of 8 rows of 240 columns each row.

After handling the normal house keeping chores of setting up the entry point, defining variables, and opening the printer path, the procedure begins by establishing the X and Y scale factors. Although setting the scale factors is easy, you must not ignore accuracy considerations. The physical chart is always 240 by 200 dots regardless of the scale. The trick in scaling is to modify the scaling factor such that the X scale is modulo 240 and the Y scale is modulo 200. I found it necessary to first fix the scale division size, and then the division size could be compensated for by the scale factor. By using this method, you often end up with either or both the X and Y axis lengths being smaller than requested. Increasing the requested X and Y axis sizes by 10% will usually give acceptable results.

The next significant step is to generate and print the chart body. There are several factors to consider here. First, the printer cannot feed paper backwards. Thus, you must print the entire chart in one pass from top to bottom. Second, the generation and printing must be accomplished eight rows at a time for each of the 240 columns in the body of the chart. This is required so that a Y scale can be printed using the MX80 upper case character set.

There is one additional characteristic of the **GRAF** Procedure that you must consider. After returning from the procedure, the Top-Of-Forms command will not generate the expected results. This is due to the use of a line height of eight dots instead of the standard 12 dots. The end result is that the MX80 line position is 112 vertical dots less than expected. This amounts to a little over nine lines that need to be compensated for by the calling routine.

I have included examples of FIRST DEGREE and EXPONENTIAL GRAF plots in **Examples II** and **III** respectively. The GAS CO. plot is an example of a second degree equation.

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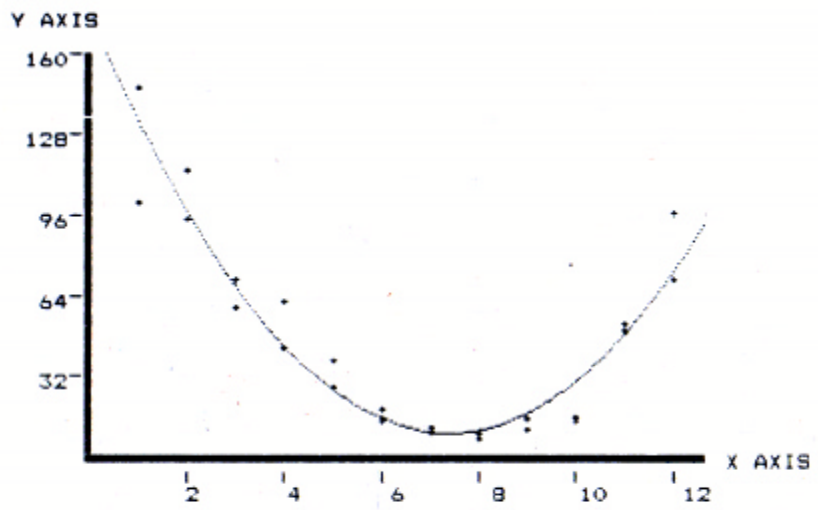
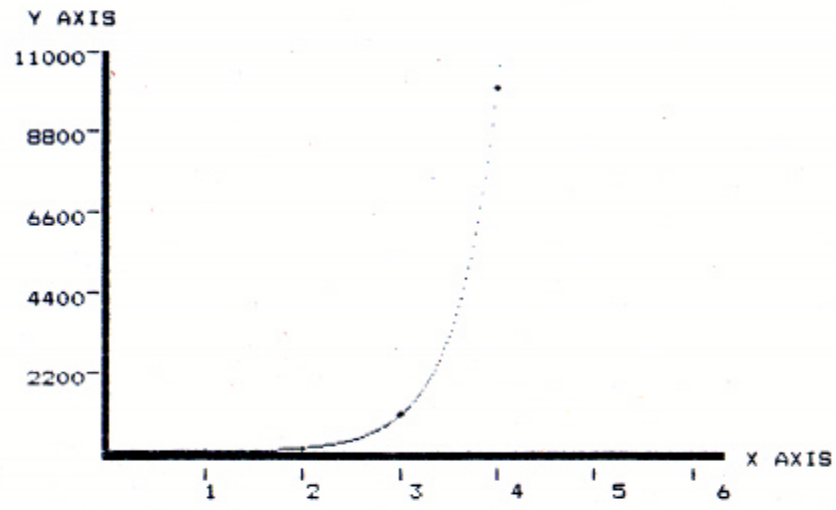
GAS CO. 81-82



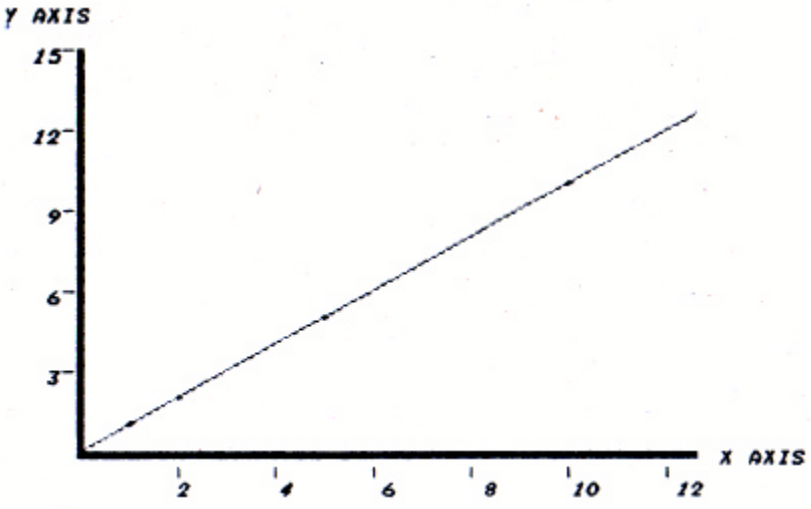
EXAMPLE I - Y axis is in dollars and X axis is months

EXPONENTIAL



EXAMPLE III - Equation for line: Y = 1.0 * 10.0 ** X

FIRST DEGREE



EXAMPLE II - Equation for line: Y = 0.0 + 1.0 * X

```
PROCEDURE GRAF

0000        PARAM CHART_NAME:STRING[20]; A_VALUE,B_VALUE,C_VALUE,X_MAX,
             Y_MAX:REAL;  TYPE_GRAF,B:INTEGER;  XB2(50),YB2(50):REAL
0040        DIM PATH_NAME:STRING[24]
004C        DIM LOWER,UPPER:REAL
0057        DIM L,J,M,N,I:INTEGER
005E        DIM X_SCALE(6),Y_SCALE(5):INTEGER
0083        DIM X_DIV,Y_DIV:INTEGER
008E        DIM X_OFF,X_POS,X_VALI:INTEGER
009D        DIM POWER_TWOS:BYTE
00A4        DIM INC:INTEGER
00AB        DIM EIGHT_DOTS,X_DOTS,MAX_LINE,SCALE_TAB,TOP_DOT,PRINTER_PATH
             :BYTE
00C6        DIM AXIS_DOTS:BYTE
00CD        AXIS_DOTS:=240
00D4        TOP_DOT:=128
00DB        SCALE_TAB:=243
00E2        EIGHT_DOTS:=255
00E9        MAX_LINE:=252
00F0        PATH_NAME:="/P"
00F9        OPEN #PRINTER_PATH,PATH_NAME:WRITE
0105
0106
0107        (* Set the X and Y scale values based upon the max values given
0149
014A        X_DIV:=X_MAX/6
0157        X_FACTOR:=240./(6.*FLOAT(X_DIV))
016E        FOR N:=1 TO 6
017E          X_SCALE(N):=X_DIV*N
018E        NEXT N
0199        Y_DIV:=Y_MAX/5
01A6        Y_FACTOR:=200./(5*FLOAT(Y_DIV))
01BA        FOR N:=1 TO 5
01CA          Y_SCALE(6-N):=Y_DIV*N
01DD        NEXT N
01E8
01E9
01EA        (* SET UP AND PRINT CHART TITLE *)
020C
020D        PRINT #PRINTER_PATH,CHR$(27); CHR$(83); TAB(19); CHART_NAME
             ; CHR$(27); CHR$(84)
022B        PRINT #PRINTER_PATH \ PRINT #PRINTER_PATH
0237
0238
0239        (* PRINT Y AXIS HEADER *)
0252
0253        PRINT #PRINTER_PATH,TAB(15); "Y AXIS"
0266        PRINT #PRINTER_PATH,CHR$(27); "A"; CHR$(8)
0278        INC:=0
027F
0280
0281        (* PRINT Y AXIS AND PLOT POINTS *)
02A3
02A4        FOR N:=1 TO 5
02B4          PRINT #PRINTER_PATH USING "X12,I6>",Y_SCALE(N);
02CC          GOSUB 100
02D0          FOR I:=1 TO 4
02E0            GOSUB 200
02E4          NEXT I
02EF        NEXT N
0301
0302
0303        (* GENERATE X AXIS *)
0318
0319        PRINT #PRINTER_PATH,TAB(20); CHR$(27); "K";
032C        PUT #PRINTER_PATH,EIGHT_DOTS
0336        PRINT #PRINTER_PATH,CHR$(0);
0341        FOR N:=1 TO 255
0351          PUT #PRINTER_PATH,AXIS_DOTS
035B        NEXT N
0366        PRINT #PRINTER_PATH," X AXIS"
0376
0377
0378
```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```
0379        (* GENERATE X AXIS TAB POINTS *)
0399
039A
039B        PRINT #PRINTER_PATH,TAB(20); CHR$(27); "K";
03AE        PUT #PRINTER_PATH,SCALE_TAB
03B8        PRINT #PRINTER_PATH,CHR$(0);
03C3        PRINT #PRINTER_PATH,CHR$(0); CHR$(0); CHR$(0);
03D6        FOR N:=1 TO 6
03E6          FOR I:=1 TO 39
03F6            PRINT #PRINTER_PATH,CHR$(0);
0401          NEXT I
040C          PUT #PRINTER_PATH,MAX_LINE
0416        NEXT N
0421        PRINT #PRINTER_PATH
0427        PRINT #PRINTER_PATH,TAB(21);
0432        FOR N:=1 TO 6
0442          PRINT #PRINTER_PATH USING "%1,I6)",X_SCALE(N);
0459        NEXT N
0464        PRINT #PRINTER_PATH,CHR$(27); "2"
0472        PRINT #PRINTER_PATH \ PRINT #PRINTER_PATH
047E        CLOSE #PRINTER_PATH
0484        END
048D
048E
048F        (* GENERATE Y AXIS TAB POINTS *)
04AF
04B0 100    PRINT #PRINTER_PATH,TAB(19); CHR$(27); "K"; CHR$(6); CHR$(0
              );
04CE        FOR K:=1 TO 5
04E0          PUT #PRINTER_PATH,TOP_DOT
04EA        NEXT K
04F5        PRINT #PRINTER_PATH,CHR$(0);
0500
0501
0502        (* GENERATE Y AXIS *)
0517
0518 200    PRINT #PRINTER_PATH,TAB(20);
052A        PRINT #PRINTER_PATH,CHR$(27); "K";
0535        PUT #PRINTER_PATH,EIGHT_DOTS
053F        PRINT #PRINTER_PATH,CHR$(0);
054A        FOR K:=1 TO 3
 55C          PUT #PRINTER_PATH,EIGHT_DOTS
0566        NEXT K
0571
0572
0573        (* CALCULATE FORMULA PLOT POINTS *)
0596
0597        INC:=INC+1
05A2        UPPER:=200-(INC*8-8)
05B4        LOWER:=UPPER-8
05C0        FOR X_POS:=1 TO 252
0500          X_DOTS:=0
05D7          X_VAL:=X_POS/X_FACTOR
05E4          IF TYPE GRAF=3 THEN
05F0            Y_POS:=A_VALUE+B_VALUE*X_VAL
0600          ELSE
0604            Y_POS:=A_VALUE+B_VALUE*X_VAL+C_VALUE*X_VAL*X_VAL
0620          ENDIF
0622          Y_POS:=Y_POS*Y_FACTOR
062E          IF Y_POS<LOWER THEN
0638            GOTO 300
063F          ELSE
0643            IF Y_POS>UPPER THEN
0650              GOTO 300
0654            ENDIF
0656          ENDIF
0658          POWER_TWOS:=INT(Y_POS-LOWER)
0666          X_DOTS:=LOR(2**POWER_TWOS,X_DOTS)
067F
0680          (* CALCULATE SAMPLE POINTS *)
0690
069E 300      FOR L:=1 TO 8
0682            X_VAL1:=XB2(L)*X_FACTOR
06C2            Y_POS:=YB2(L)*Y_FACTOR
0601            IF X_POS=X_VAL1-1 THEN
06E1              IF Y_POS<LOWER THEN
06EE                GOTO 500
06F2              ELSE
06F6                IF Y_POS>UPPER THEN
0703                  GOTO 500
0707                ENDIF
0709              ENDIF
070B              POWER_TWOS:=INT(Y_POS-LOWER)
0719              X_DOTS:=LOR(2**POWER_TWOS,X_DOTS)
072B            ELSE
072F              IF X_POS=X_VAL1+1 THEN
073F                IF Y_POS<LOWER THEN
074C                  GOTO 500
0750                ELSE
0754                  IF Y_POS>UPPER THEN
0761                    GOTO 500
0765                  ENDIF
0767                ENDIF
0769                POWER_TWOS:=INT(Y_POS-LOWER)
0777                X_DOTS:=LOR(2**POWER_TWOS,X_DOTS)
0789              ELSE
078D                IF X_POS=X_VAL1 THEN
079A                  FOR J:=1 TO 3
07AA                    M:=J-2
07B5                    IF Y_POS+M<LOWER THEN
07C7                      GOTO 400
07CB                    ELSE
07CF                      IF Y_POS+M>UPPER THEN
07E1                        GOTO 400
07E5                      ENDIF
07E7                    ENDIF
07E9                    POWER_TWOS:=INT(Y_POS+M-LOWER)
07FC                    X_DOTS:=LOR(2**POWER_TWOS,X_DOTS)
080E 400                NEXT J
081C                  ENDIF
081E                ENDIF
0820              ENDIF
0822 500      NEXT L
0830          PUT #PRINTER_PATH,X_DOTS
083A        NEXT X_POS
0845        PRINT #PRINTER_PATH
0848        RETURN
```

John J. Strunk

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LINKING LOADER

Part 2

Continued from Last Month

Using the
LINKING LOADER
with the
Radio Shack DOS

SETTING UP YOUR SYSTEM

The Loader Program must be copied to your program development diskettes, and the Linker Subroutine must be copied to your library diskettes. An undocumented feature of the Color Computer's DOS is the ability to copy from one diskette to another with only a Single Disk Drive. Type in the Copy command, but do not specify an output Filename; for example, **COPY "LOADER.BIN"**. After the DOS loads the file, it will display a message to install the Destination Diskette. The name of the Linker module is LINKER.BIN.

You may also "LOADM" and "SAVEM" the loader.

SAVEM "LOADER",&HØE00,&H12D7,&HØE00

The Loader is written in Position Independent Code and will execute from anywhere in RAM. The buffer size will automatically be adjusted to suit the Program.

OPERATION

Type LOADM "LOADER", then EXEC, to load and execute the Loader.

INPUT AND OUTPUT FILES

The message "MAIN PROGRAM NAME, OUTPUT FILE NAME" will be displayed. Enter the name of the main module and the name of the output module, separated by a comma. If no output file is named, the output will be written back to the input file. The output module will contain the merged program ready to be loaded, linked, and executed. The default extension for all files is BIN.

DISPLAYING THE LOAD MAP

As the modules are loaded, a load map will be displayed. You may direct the map to the screen or the printer. The message "MAP TO SCREEN OR PRINTER(S/P)" will be displayed. Type S to display the map on the screen or P to print the map on the printer. The load map displays the load addresses of the modules, as well as the end address and transfer address of the program. The Loader automatically appends the Linker Module after loading the specified modules. The program's transfer address will be the linker's execution address, which will be included in the load map.

USING A LIBRARY DISKETTE

You may find it convenient to keep your subroutine library on its own diskette. If you have only one drive, you will have to swap diskettes after the main module is loaded and before the output file is written. After the main module is loaded, the message "LOAD LIBRARY DISK AND HIT ENTER" will be displayed, and the Loader will pause and let you swap diskettes. After the last module is loaded, the message "LOAD OUTPUT DISK AND HIT ENTER" will be displayed, and once again the Loader will pause and let you swap diskettes.

BUFFER SIZE

On a 16K system, the buffer size is approximately 10,900 bytes. On a 32K system the buffer size is approximately 27,200 bytes. If you run out of buffer space, the message "OUT OF MEMORY" will be displayed, and the Loader will abort.

LINKING

Linking is the process of loading the execution addresses of the subroutines into a jump table so they can be located when the Program calls them.

The Linker module performs the linking in two passes. Pass 1 gets the entry point of each module and stores it in the jump table. The module's location on the jump table is at **2 * the Module Number**. If the jump table is at $ØEØØ, the entry point of module 3 will be at $ØE06. The Linker presented here loads the jump table at $ØEØØ under RS DOS, but you can change it to fit your requirements.

Pass 2 calls the initialization routines of each module. The address of the vector is passed to the module in the Y register, in case you want to code jump tables in the modules

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themselves. Typical code might be:

```
INIT   LDX 4,Y ENTRY POINT FOR SUBROUTINE 2
       STX SUB4,PCR
       LDX 10,Y ENTRY POINT FOR SUBROUTINE 5
       STX SUB10,PCR
       RTS RETURN TO LINKER
```

To call the subroutine, use:

JSR [SUB4,PCR]

After linking, the Linker passes control to the Main Module's entry point (the entry location for the Program you are writing) as specified in the main module's preface.

The Source Code for the Loader and the Linker presented here was written for the TSC Macro Assembler which is supplied with some of the Color Computer FLEX Conversions, but should be compatible with most 6809 Assemblers which support Macros and Conditional Assembly.

The Loader calls ROM routines for File and Terminal I/O, so will probably only work with **V1.1 BASIC, V1.0 Ex. BASIC,** and **V1.0 Disk BASIC** ROM sets at this time. We would be interested in hearing from you if you change the calls over to the new ROMs.

ERROR MESSAGES

The loader displays two errors regarding memory overflow. Other messages are produced by BASIC.

OUT OF MEMORY

The buffer is full. Your program, plus the subroutines, are too big for the buffer.

NAME TABLE OVERFLOW

The subroutine name table has space for 30 entries. This message is displayed when the 31st is encountered. Don't forget that the Link Module will be added to your program.

The most common BASIC error message will probably be the "NE" error when you name a subroutine which is not stored on the disk. The **last entry** on the load map will be the erroneous name.

- - - - - - - - - - - - - - -

Using the
LINKING LOADER
with the
FLEX DOS

OPERATION

Type the entry
LOADER Input-File <Output-File>

INPUT AND OUTPUT FILES

If no output file is named, the output will be written to a file with the same name as the input file, with a CMD Extension. The output module will contain the merged program ready to be loaded, linked, and executed. The default extension for the input file is BIN. The default extension for the output file is CMD.

DISPLAYING THE LOAD MAP

As the modules are loaded, a load map will be displayed (which can easily be directed to a Printer or File under FLEX). The load map displays the load addresses of the modules, as well as the end address and transfer address of the program. The Loader automatically appends the Linker Module after loading the specified modules. The program's transfer address will be the linker's execution address, which will be included in the load map.

BUFFER SIZE

On a 16K system, the buffer size is approximately 14,000 bytes, while on a 32K system the buffer size is approximately 30,000 bytes. On a 48K system the buffer size is approximately 46,000 bytes. If you run out of buffer space, the message "OUT OF MEMORY" will be displayed, and the Loader will abort.

LINKING

Linking is the process of loading the execution addresses of the subroutines into a jump table so they can be located when the Program calls them.

The linker module performs the linking in two passes. Pass 1 gets the entry point of each module and stores it in the jump table. The module's location in the jump table is at the **Module Number * 2.** If the jump table is at $BF00, module #3's entry point will be loaded at $BF06.

Pass 2 calls the initialization routines of each module. The address of the vector is passed to the module in the Y register, in case you want to code the jump table in the module itself. Typical code might be:

```
INIT   LDX 4,Y ENTRY POINT FOR SUBROUTINE 2
       STX SUB4,PCR
       LDX 10,Y ENTRY POINT FOR SUBROUTINE 5
       STX SUB10,PCR
       RTS RETURN TO LINKER
```

To call the subroutine use:

JSR [SUB4,PCR]

After linking, the Linker passes control to the main module's entry point as specified in the main module's preface.

The source code for the Linker and the Loader is written for the TSC Macro Assembler. Programs to run under either FLEX or Radio Shack DOS can be generated. Make your selection with the command line parameter &A. Use 'F' to select FLEX, or use 'R' to select Radio Shack, as shown;

ASMB LOADER +F for **FLEX**
ASMB LOADER +R for **Radio Shack**

ERROR MESSAGES

The loader displays two error messages regarding memory overflow; other messages are produced by FLEX.

OUT OF MEMORY

The buffer is full. Your program plus the subroutines are too big for the buffer.

NAME TABLE OVERFLOW

The subroutine name table has space for 30 entries. This message is displayed when the 31st is encountered. Don't forget that the Link Module will be added to your program.

If you get a **FILE NOT FOUND** message from FLEX, the last entry on the load map will be the erroneous name.

Roland Waggoner

```
OPT PAG
NAM LOADER
IFC '&A','R'
STTL RS DOS VERSION 1.0
ELSE
STTL FLEX VERSION 1.0
ENDIF
PAG

*****************************************
*                                       *
* LOADER PROGRAM FOR THE RADIO SHACK    *
* COLOR COMPUTER, with or w/o FLEX      *
*                                       *
* COPYRIGHT (C) 1983 ROLAND WAGGONER    *
*     and Computer Publishing Inc.      *
*                                       *
*****************************************

*
*  USE THE COMMAND LINE PARAMETER &A TO INDICATE
*  A FLEX OR A RADIO SHACK BASIC ASSEMBLY.
*  USE F FOR FLEX.
*  USE R FOR RS BASIC.
*
*****************************************

*
* MACRO TO DEFINE OUTPUT STRING FOLLOWED BY
* A TERMINATOR. THE TERMINATOR IS $00 FOR
* RS DOS, OR $04 FOR FLEX
*
PSTRNG MACRO
 IFC '&A','R'
 FCC '&1',$00
 ELSE
 FCC '&1',$04
 ENDIF
 ENDM

*
* MACRO TO CALL GET CHARACTER FROM FILE
* ROUTINE. IF ASSEMBLED FOR RS DOS THEN
* JUST JSR GETCHR(?). IF ASSEMBLED FOR
* FLEX THE LBSR RCHR WHICH CALLS FMS AND
* DOES ERROR CHECKING.
*
RDCHR MACRO
 IFC '&A','R'
 JSR GETCHR
 ELSE
 LBSR RCHR
 ENDIF
 ENDM
```


OS-9* SOFTWARE

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D.P. Johnson
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```
* * * * * * * * * * * * * * * * * *
*
*
* -- Radio Shack ORG and EQUates
*
*
*
 IFC '&A','R'
*
 ORG $E00 To get above Disk DOS
*
* EQU'S
*
TXTOUT EQU $B99C OUTPUT TEXT STRING
TXTIN EQU $A390 INPUT TEXT STRING
TERMBF EQU $02DD TERMINAL INPUT BUFFER
DFLTD EQU $095A ADDRESS OF DEFAULT DISK
DFLTDD EQU $EB DRIVE NUMBER FOR OPEN
FNBUFF EQU $94C DOS' FILENAME BUFFER
FTYPE EQU $957 ADDRESS OF FILE TYPE AND FORMAT
SETOPN EQU $C8A4 OPEN SETUP ROUTINE
OPEN EQU $C468 OPEN A FILE
DEVNO EQU $6F DEVICE NUMBER ADDRESS
SCROUT EQU $A30A OUTPUT CHR TO SCREEN
GETCHR EQU $A176 GET CHARACTER FROM DEVICE
POLCAT EQU $A1C1 POLL KEYBOARD
CHROUT EQU $A282
PUTCHR EQU CHROUT
FRLEN EQU $97C ADDRESS OF FILENAME LENGTH
CLOSE EQU $CA53 CLOSE A FILE
CLOSEM EQU $CA3B CLOSE ALL OPEN FILES
BLANK EQU $20
CR EQU $0D CARRIAGE RETURN
BREAK EQU $03 BREAK KEY
FNLEN EQU 11 FILENAME LENGTH
 ENDIF
*
*
* * * * * * * * * * * * * * * * * *


* * * * * * * * * * * * * * * * * *
*
*
* -- FLEX System EQUates
*
*
*
 IFC '&A','F'
*
* EQU'S
*
TXTIN EQU $CD1B INPUT TEXT STRING
OUTADR EQU $CD45 OUTPUT HEX VALUE
TXTOUT EQU $CD1E OUTPUT TEXT STRING
MEMEND EQU $CC2B END OF MEMORY & BUFFER
DRNUM EQU $CC0C WORKING DRIVE NUMBER
FNBUFF EQU SFCB+3
GETCHR EQU $D406 GET CHR FROM FILE
INCH2 EQU $CD0C INPUT CHR FROM TERMINAL
OUTCH2 EQU $CD12 OUTPUT CHR TO TERMINAL
CLOSEM EQU $D403 CLOSE ALL FILES
FMS EQU $D406 FMS CALL
CLOSE EQU FMS
FNLEN EQU 12 FORMATTED FILENAME LENGTH
WARMS EQU $CD03 RETURN TO FLEX
INCH EQU $CD09 INPUT CHR FROM KEYBOARD
PUTCHR EQU $CD18 OUTPUT CHARACTER
CRLF EQU $CD24 PRINT CR LF
POLCAT EQU $CD4E KEYBOARD STATUS
BFPTR EQU $CC14 INPUT BUFFER POINTER
CHROUT EQU FMS OUTPUT CHR TO FILE
GETFIL EQU $CD2D PARSE FILENAME
SETEXT EQU $CD33 SET DEFAULT EXTENSION
LSTRM EQU $CC11 LAST TERMINATOR
NXTCH EQU $CD27 GET NEXT CHR FROM INPUT BUFFER
RPTERR EQU $CD3F REPORT FILE ERROR
EOL EQU $CC02 COMMAND DELIMITER
CR EQU $0D CARRIAGE RETURN
BLANK EQU $20
 ENDIF
*
*
* * * * * * * * * * * * * * * * * *

*
* Was a valid System requested
*     for Assembly?
*
 IFNC '&A','R'
 IFNC '&A','F'
 ERR NOT VALID SYSTEM CODE
 ENDIF
 ENDIF

*
*
* If assembly is for FLEX, set the ORG
*     at $200 because the FLEX DEBUG
*     Program uses Interrupts, which the
*     BASIC ROM vectors to the $100 area.
*          Can be ORG'd at $00 if
*          DEBUG will not be used.
*
 IFC '&A','F'
 ORG $0200
 ENDIF


LOADER EQU *
*
* If assemble for Radio Shack
*
 IFC '&A','R'
 STS BASSTK,PCR SAVE BASIC'S STACK FOR RETURN
 LEAX -50,S MARK END OF BUFFER
 STX MEMEND,PCR
 LEAX BUFFER,PCR ADDRESS OF PROGRAM BUFFER
 STX BUFFAD,PCR
 LEAX MSG1,PCR FILENAME PROMPT
 LBSR INPUTP GET INPUT AND OUTPUT FILENAMES

* SET UP TO LOAD MAIN PROGRAM
 LDA #', COMMA
 LBSR INXCHR FIND DELIMITER
 PSHS A,X SAVE DELIMITER AND POINTER
 LEAY MODTAB,PCR SET UP TO MOVE FILENAME TO TABLE
 LDX #TERMBF KEYBOARD BUFFER
 LBSR PARSFN PARSE FILENAME AND MOVE TO TABLE
 LDA #$FF MARK END OF TABLE
 STA MODTAB+12,PCR
 PULS A,X GET DELIMITER AND POINTER
 TSTA WAS DELIMITER ZERO?
 BNE LINKR1 GO IF NOT

* IF ONLY ONE FILE SPECIFIED, LINKED PROGRAM IS
* COPIED BACK TO MAIN FILE, SO PARSED FILENAME
* IS COPIED BACK TO OUTPUT FLENAME
 LEAU OUTFNM,PCR OUTPUT FILENAME STORE
 LEAX MODTAB,PCR
 LDB #12 MOVE 12 BYTES
 LBSR MOVMEM COPY FILENAME
 BRA MAPDSP

* PARSE OUTPUT FILENAME AND SAVE
LINKR1 LEAX 1,X SKIP DELIMITER
 TFR X,Y SAVE POINTER
 LBSR LENSTR COUNT BYTES
 TFR Y,X RESTORE POINTER
 LEAY OUTFNM,PCR ADDRESS OF OUTPUT FILENAME
 LBSR PARSFN PARSE AND STORE OUTPUT FILENAME

*
* ASK WHERE MAP SHOULD BE DISPLAYED
MAPDSP LEAX MSG2,PCR PROMPT
 LBSR INPUTP GET INPUT
 CLR DSPDVC,PCR SET SCREEN DEFAULT
 LDA ,X GET INPUT
 CMPA #'P WAS PRINTER SPECIFIED?
 BNE LOAD GO IF NOT
 LDA #-2 ELSE SET PRINTER
 STA DSPDVC,PCR DEVICE
 LEAX MSG7-1,PCR PRINT TITLE
 STA DEVNO
 JSR TXTOUT OUTPUT THE TITLE
 LDA #CR FOLLOWED BY 2 CR'S
 JSR CHROUT
 LDA #CR
 JSR CHROUT
 ENDIF
*
* End of Radio Shack portion


*
* If assemble is for FLEX
*
 IFC '&A','F'  FLEX CODE
 BRA LOADS SKIP VERSION NUMBER
VN FCC 1 VERSION 1
LOADS EQU *
 JSR CRLF
 LEAX BUFFER,PCR ADDRESS OF BUFFER
 STX BUFFAD,PCR FOR COMPARES
 LDA DRNUM INITIALIZE DRIVE NUMBER
 STA LNKNAM

* GET FILENAMES FROM INPUT BUFFER
 LEAX SFCB,PCR FCB
 JSR GETFILE PARSE FILENAME
 LBCS FERR GO IF FILENAME ERROR
 CLRA .BIN EXTENSION
 JSR SETEXT SET DEFAULT EXTENSION
 LEAX SFCB+3,PCR ADDRESS OF PARSED FILENAME
 LEAU MODTAB,PCR MODULE TABLE
 LDB #12 MOVE 12 BYTES
 LBSR MOVMEM MOVE NAME TO TABLE
 LDA #$FF MARK END OF TABLE
 STA ,U

*
* NOW CHECK FOR OUTPUT FILENAME. IF THERE
* IS ONE SPECIFIED PARSE IT AND SAVE IT.
* IF ONE IS NOT SPECIFIED, COPY THE INPUT
* FILENAME, BUT SET THE EXTENSION TO CMD
*
 LDA LSTRM LAST TERMINATOR
 CMPA #CR CARRIAGE RETURN?
 BEQ OUTF GO IF SO
 CMPA EOL COMMAND SEPARATOR?
 BEQ OUTF GO IF SO
 CMPA #BLANK BLANK
 BEQ OUTF GO IF SO

* GET OUTPUT FILENAME FROM INPUT BUFFER
 LEAX SFCB,PCR FCB
 JSR GETFILE GET FILENAME
 LDA #2 CMD DEFAULT EXTENSION
 JSR SETEXT SET DEFAULT
 LEAX SFCB+3,PCR ADDRESS OF PARSED FILENAME
 LEAU OUTFNM,PCR STORAGE AREA
 LDB #12 MOVE 12 BYTES
 LBSR MOVMEM MOVE NAME TO STORAGE
 BRA LOAD GO START LOAD
OUTF LEAX MODTAB,PCR COPY INPUT NAME
OUTF1 LEAU OUTFNM,PCR OUTPUT FILENAME STORAGE
 LDB #9 MOVE 9 BYTES
 LBSR MOVMEM GO MOVE IT
 LEAX CMDST,PCR ADDRESS OF 'CMD'
 LDB #3 MOVE 3 BYTES
 LBSR MOVMEM MOVE EXTENSION
 ENDIF
*
* End of FLEX portion


*
*
* START LOADING MODULES ON MODTAB LIST. THE FIRST
* MODULE IS THE MAIN MODULE. AFTER EACH MODULE IS
* LOADED, ANY EXTERNAL REFERENCES ARE ADDED TO THE
* END OF THE LIST IF THEY ARE NOT ALREADY ON THE
* LIST
*
*
LOAD CLR MODCNT,PCR MAIN MOD FLAG
 LEAX BUFFER,PCR BEGINNING OF PGM BUFFER
 STX LDADD,PCR
 STX RECADD,PCR INITIALIZE RECORD LOAD ADDRESS
 LEAX MODTAB,PCR TABLE INDEX
 STX MODTBP,PCR FIRST ENTRY POINTER
 STX TABEND,PCR LAST ENTRY POINTER
LOAD1 EQU * START THE LOAD

 * if Radio Shack
 *
  IFC '&A','R'
  LBSR CKBRK CHECK IF BREAK KEY IS PRESSED
  ENDIF

 *
 * OPEN THE FILE
 *

 * if FLEX
 *
  IFC '&A','F'
  LEAX 1,X SKIP DRIVE NUMBER
  ENDIF

  LBSR DSPMOD GO DISPLAY THE MODULE NAME

 * if FLEX
 *
  IFC '&A','F'
  LEAX -1,X RESTORE FILENAME POINTER
  ENDIF

 * if RS
 *
  IFC '&A','R'
  LDA #'I INPUT FILE
  LDB #1 DEVICE NUMBER
  ELSE
 *
 * if not, then FLEX
 *
  LDA #1 OPEN FOR INPUT
  ENDIF

  LBSR SOPEN GO OPEN THE FILE
  CLR RECFLG,PCR 1ST RECORD FLAG

 * if RS
 *
  IFC '&A','R'
```


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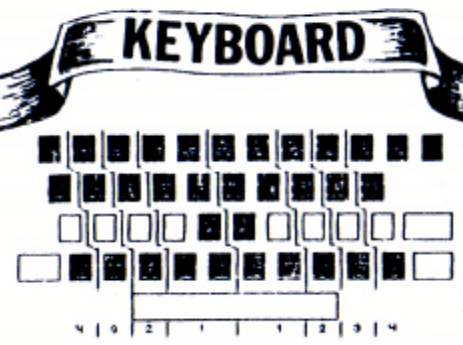

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```
 LDB #1 FILE DEVICE NUMBER
 STB DEVNO
 ENDIF

LOAD2 JSR GETCHR GET FLAG BYTE

* if RS
*
 IFC '&A','R'
 TSTA TEST FOR EOF
 LBLT LOADF GO IF EOF RECORD
 RDCHR  GET MSB OF RECORD LENGTH
 STA ,--S SAVE
 RDCHR  LSB
 STA 1,S
 RDCHR  MSB OF LOAD ADDRESS
 STA ,--S
 RDCHR  LSB
 STA 1,S
 ELSE

* else, assemble for FLEX
*
 BEQ LOAD22 GO IF NO ERROR
 LDA 1,X GET ERROR CODE
 CMPA #$8 EOF
 LBEQ LOADF GO IF SO
 LBRA FERR ELSE REPORT ERROR AND ABORT
LOAD22 CMPA #$16 TRANSFER ADDRESS RECORD?
 LBEQ LOADF GO IF SO
 LEAS -4,S RESERVE SPACE FOR RECORD CONTROL
 RDCHR  MSB OF LOAD ADDRESS
 STA ,S
 RDCHR  LSB
 STA 1,S
 CLR 2,S MSB OF LENGTH
 RDCHR  GET LENGTH
 STA 3,S
 ENDIF

 TST MODCNT,PCR IS IT MAIN?
 BNE LOAD3 GO IF NOT
 TST RECFLG,PCR 1ST RECORD?
 BNE LOAD4 GO IF NOT
* 1ST RECORD OF MAIN MODULE HAS THE SAVED LOAD
* ADDRESS
 LDD ,S LOAD ADDRESS
 STD PGMADD,PCR SAVE FOR OUTPUT LATER
 LBSR DSPADD DISPLAY IT
 LDD LDADD,PCR MEMORY LOAD ADDRESS
 SUBD ,S OFFSET TO ADD TO LOAD ADDRESS
 STD OFFSET,PCR FOR STORING SUBSEQUENT RECORDS
 STD OFFST1,PCR FOR DISPLAYING LOAD ADDR. OF MOD
 INC RECFLG,PCR SET NOT FIRST TIME FLAG
 BRA LOAD4
LOAD3 LDD LDADD,PCR OFFSET FOR SUBROUTINES IS THE
 STD OFFSET,PCR LOAD ADDRESS
 STD RECADD,PCR INITIALIZE RECORD LOAD  ADDRESS
 TST RECFLG,PCR IS IT FIRST RECORD?
 BNE LOAD4 GO IF NOT
 SUBD OFFST1,PCR DISPLAY EXECUTION LOAD ADDRESS
 LBSR DSPADD
```


COLOR COPY

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```
 INC RECFLG,PCR SET NOT FIRST RECORD
LOAD4 EQU *

* if RS
*
 IFC '&A','R'
 LDB #1 UPDATE THE FILE DEVICE NUMBER
 STB DEVNO
 ELSE

* else FLEX
*
 LEAX SFCB,PCR RESTORE FCB ADDRESS
 ENDIF

 PULS D GET ADDRESS AGAIN
 ADDD OFFSET,PCR ADD OFFSET
 STD RECADD,PCR SAVE
 TFR D,Y INDEX FOR STORING
 PULS D LENGTH
 ADDD RECADD,PCR CALCULATE END ADDRESS
 SUBD #1
 STD ENDADD,PCR

* if FLEX
*
 IFC '&A','F'
 CMPD MEMEND CHECK OUT OF MEMORY
 ELSE

* else, RS
*
 CMPD MEMEND,PCR CHECK OUT OF MEMORY
 ENDIF

 LBHI NOMEM GO IF OUT OF MEMORY
LOAD5 EQU *
 RDCHR  GET BYTE
 STA ,Y+ SAVE BYTE
 CMPY ENDADD,PCR DONE?
 BLS LOAD5 LOOP IF NOT
 LBRA LOAD2 GET NEXT RECORD
LOADF EQU * END OF FILE PROCESSING
 LDB #3 OFFSET INTO PREFACE POINTING
*                          TO END OF MOD
 LBSR GETADD GET END OF JUST LOADED MODULE
 STX PGMTOP,PCR END OF PROGRAM

* if RS
*
 IFC '&A','R'
 TST MODCNT,PCR MAIN MODULE
 BNE LOADC GO IF NOT
 LEAX MSG4,PCR CHANGE DISK MESSAGE
 LBSR INPUTP
 ENDIF


*
* NOW START COPYING ANY EXTERNAL REFERENCES TO THE
* MODULE TABLE
*

* FIRST CLOSE THE FILE
LOADC EQU *

* if RS
*
 IFC '&A','R'
 LDB #1 REFRESH FILE NUMBER
 STB DEVNO
 ELSE

* else FLEX
*
 LEAX SFCB,PCR FCB
 LDB #4 CLOSE FUNCTION
 STB ,X STORE IN FCB
 ENDIF

 JSR CLOSE
 LDB #5 OFFSET INTO PREFACE WHICH POINTS
*         TO RELATIVE ADDRESS OF MODULE
*         NAMES
 LBSR GETADD GET ADDRESS OF MODULE NAMES
 BEQ LOADN GO IF NO EXTERNALS NAMED
LOADC1 PSHS X SAVE POINTER
 LEAY TEMP,PCR MOVE NAME TO TEMP. FOR COMPARE
 LBSR PARSFN PARSE FILENAME

* SEARCH TABLE TO SEE IF MODULE ALREADY LOADED
 LEAY TEMP,PCR ADDRESS OF NAME
 LEAX MODTAB,PCR
 LDB #12 12 BYTE ENTRIES
 LBSR SEARCH SEARCH TABLE
 BEQ LOADC2 GO IF ITEM ALREADY IN TABLE

* COPY NAME FROM BUFFER TO TABLE
 LDU TABEND,PCR ADDRESS OF END OF TABLE
 LEAU 12,U POINT TO NEXT ENTRY
 STU TABEND,PCR

* if RS
*
 IFC '&A','R'
 LDX #FNBUFF DOS BUFFER
 ELSE

* else FLEX
*
 LEAX FNBUFF,PCR DOS BUFFER
 ENDIF

 LDB #FNLEN MOVE FILENAME
 LBSR MOVMEM GO MOVE FILENAME
```

```
* if RS
*
 IFC '&A','R'
 LDA DFLTDD DRIVE NUMBER
 STA ,U+
 ENDIF

 CMPU BUFFAD,PCR TABLE FULL?
 LBHS NOTAB GO IF YES
 LEAX LNKNAM,PCR LINKER FILENAME
 LDB #12 MOVE 12 BYTES
 LBSR MOVMEM MOVE LINKER FILENAME TO END OF TABLE
 LDA #$FF MARK END OF BUFFER
 STA ,U
LOADC2 PULS X RESTORE POINTER TO MODULE'S TABLE
 LBSR LENSTR GET POINTER TO NEXT ITEM
 LEAX 1,X SKIP MARK
 TST ,X TEST FOR END OF TABLE
 BGT LOADC1 GO GET NEXT ITEM

*
* LOAD NEXT ITEM ON LOAD LIST
*
LOADN INC MODCNT,PCR RESET MAIN MOD FLAG
 LDX MODTBP,PCR TABLE INDEX
 LEAX 12,X POINT TO NEXT ENTRY
 TST ,X END OF TABLE?
 BLT BINOUT GO START OUTPUT IF SO
 STX MODTBP,PCR UPDATE POINTER
 LDX PGMTOP,PCR END OF LAST MODULE
 STX LOADD,PCR
 LDX MODTBP,PCR POINT TO FILENAME
 LBRA LOAD1 START LOADING MODULE

*
* LAST MODULE LOADED - START OUTPUT
*
BINOUT EQU *

* if RS
*
 IFC '&A','R'
 LBSR CKBRK CHECK IF BREAK KEY IS PRESSED
 ENDIF

* MOVE LOAD MAIN'S ADDRESS TO LINKER
 LDD LDADD,PCR LINKER'S LOAD ADDRESS
 SUBD OFFST1,PCR ULTIMATE LOAD ADDRESS
 PSHS D SAVE
 LDD PGMADD,PCR MAIN'S LOAD ADDRESS
 SUBD ,S OFFSET FROM LINKER TO MAIN
 LDX LDADD,PCR LINKER ADDRESS
 STD 1,X STORE OFFSET TO MAIN IN LINKER'S PREFACE
 PULS X LINKER'S LOAD ADDRESS
 LEAX 9,X PGM EXECUTION ADDRESS
 STX XADD,PCR SAVE FOR BINARY FILE

*
* DISPLAY THE TRANSFER ADDRESS
*
 LEAX MSG8,PCR 1ST 8 CHARACTERS
 LBSR DSPMOD

* if FLEX
*
 IFC '&A','F'
 LDA #BLANK SPACE BETWEEN WORDS
 JSR PUTCHR
 ENDIF

 LEAX MSG8+8,PCR 2ND 8 CHARACTERS
 LBSR DSPMOD
 LDD XADD,PCR TRANSFER ADDRESS
 LBSR DSPADD DISPLAY IT

* DISPLAY THE END ADDRESS
 LEAX MSG6,PCR  'END'
 LBSR DSPMOD
 LDD PGMTOP,PCR ADDRESS
 SUBD OFFST1,PCR CALCULATE ULTIMATE LOAD ADDRESS
 LBSR DSPADD GO DISPLAY IT

*
* COPY FILENAME TO DOS BUFFER
*

* if RS
*
 IFC '&A','R'
 LEAX MSG5,PCR CHANGE DISK MESSAGE
 LBSR INPUTP
 LEAX OUTFNM,PCR OUTPUT FILENAME
 LDA #'O OUTPUT FILE
 LDB #1 FILE DEVICE NUMBER
 LDY #$200 M/L BINARY FILE TYPE
 ELSE

* else for FLEX
*
 LEAX OUTFNM,PCR NAME OF OUTPUT FILENAME
 LDA #2 OPEN FOR OUTPUT
 ENDIF

 LBSR SOPEN GO OPEN THE FILE

* SET UP POINTERS, ETC
 LDX PGMTOP,PCR END OF PROGRAM
 CLR ,X LAST MOUDLE MUST END WITH ZERO
```

Continued next month

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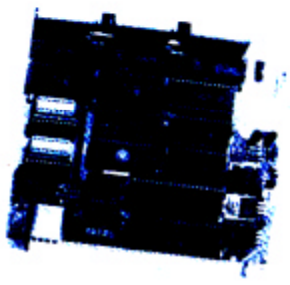
Intelligent Serial I/O Processor Board #11



The GIMIX Intelligent Three-port RS-232C Serial Interface can significantly increase the throughput of a multi-user system. By buffering data transfers between users and the system, and preprocessing the data, it reduces the number of interrupts to the host CPU, allowing the host more time for other processing tasks.

Features:
- Independent on-board 2MHz 6809 CPU
- Up to 3OK of on-board memory (EPROM and RAM)
- Buffered data transfer between host and on-board CPUs using a 128OB FIO with 128 byte bi-directional FIFO buffer and mailbox message capabilities
- Three RS-232C serial I/O ports (6850As) with software selectable baud rates, word length, stop bits, and parity
- Each port has five "handshake" lines for modem control applications
- The on-board 6809 can be reset by the host processor
- Compatible with memory-to-memory DMA transfers to/from the GIMIX 6809 CPU III
- Sense switches and status LEDs that can be used to select software options and indicate board status
- Separate 26-pin cable connections for each port

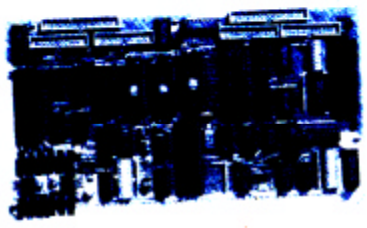
Appropriate on-board firmware and operating system drivers are required. Then up to three #95 cable sets (DB-25S connectors).

Also available — Intelligent three-port serial interface #13 version for the 50 pin bus.

OS-9 firmware and drivers for the Intelligent 3-port Serial Interface

The OS-9 firmware and drivers enhance the performance of multi-user systems, while providing functions (including single character I/O) equivalent to the standard ACIA type drivers normally used for terminals and serial printers. Input line editing functions (backspace, echo, line dup, and repeat, etc.) are handled by the I/O board, rather than the host, allowing the host more time for other processing tasks. The host is only interrupted when a complete input line (terminated by a "CR") is entered, or certain special characters are received. Input and output data are buffered on the I/O board so that the host can perform other tasks while serial data is being transmitted or received. When used with the GIMIX CPU III, block data transfers between the I/O board and the host use the CPUs memory-to-memory DMA to further enhance throughput. In addition to performance enhancements, features such as software selectable baud rates and transmission characteristics (number of data bits, stop bits, parity etc.) are provided. The board also transmits "messages" to any or all I/O ports to indicate that the I/O processor is ready and "waiting for the task", and that the host is "on-line" and has opened a path to the port. Messages to individual ports can be disabled.

Intelligent Parallel I/O Processor Board #12



The Intelligent Four-port Parallel Interface can be used to improve system performance by buffering data transfers to parallel peripherals such as printers and/or by buffering and pre-processing parallel input data from keyboards, sensors, etc.

Features:
- Independent on-board 2MHz 6809 CPU
- Up to 32K of on-board memory (EPROM and RAM)
- Buffered data transfer between host and on-board CPUs using a 128OB FIO with 128 byte bi-directional FIFO buffer and mailbox message capabilities
- Four fully buffered 8-bit parallel ports with handshaking and input/output latches (two 6822 VIAs). Each 6822 also has two 16-bit counter/timers and a shift register for serial data transfers.
- Software programmable direction for each bit on two of the four ports (1 per VIA). The other 2 ports can be individually programmed as 8 in or 8 out. The bi-directional handshake lines can be programmed as inputs or outputs.
- The on-board 6809 can be reset by the host processor
- Full 20-bit address decoding. It can be addressed on any 4 byte boundary in 1M byte or address space.
- Compatible with memory-to-memory DMA transfers to/from the GIMIX 6809 CPU III
- Sense switch and status LEDs that can be used to select software options and indicate board status.
- Separate 36-pin cable connections for each port plus two 26-pin. Centronics pinout compatible connectors. Each 36 pin connector uses 2 ports to allow full implementation of the Centronics printer interface.

Appropriate on-board firmware and operating system drivers are required. Then up to four #95 cable sets (DB-25P connectors) or two 36-pin cable sets with Centronics compatible connection. Centronics compatible cable sets include a back panel connector plate for the Classy Chassis. Back panel to printer cables are also available.

GIMIX 2MHz Input/Output Boards

Serial Interface Boards

SERIAL INTERFACE boards use the versatile MC6850 programmable ACIA that provides software control over number of data bits, parity, stop bits, and interrupts. They all feature RS-232 compatible signal output with RTS, CTS, and DCD, hand shake signals.

All serial boards have gold plated, header type connectors for corrosion resistance and reliable operation.

2 Port Serial Interface #43

Solderless jumpers provide easy selection and changing of options.

(for the 30 pin bus)

Features:
- 2 separate RS-232 ports (with handshake) on a single board
- Jumper programmable connector pinouts for either connection to external devices. (Connector can be programmed as DCE or DTE.)
- Provides direct plug in of standard RS-232 connection when used with optional GIMIX cable set.
- Individual baud rate and interrupt select jumpers for each port.
- Selectable for use with 8 or 16 addresses per slot.

Uses 1 or 2 #95 cable sets.

8 Port Serial Board #46

The GIMIX 8 PORT SERIAL INTERFACE has 3 header type connectors for external connections. The center connector provides Transmit Data, Receive Data, and signal ground for all 8 ports. The outer 2 connectors each provide TX, RX, and signal ground as well as the 3 handshake lines RTS, DCD, and CTS for 4 ports.

(for the 50 pin bus)

Features:
- 8 separate RS-232 ports (with handshake) on a single 50 pin board
- Extended address decoding for the 5550C bus
- Occupies only 16 bytes of address space
- DIP-switch addressable to any 16 byte boundary
- Individual DIP switch selectable baud rates and interrupts for each port
- On board baud rate generator for baud rates from 75 to 38.4K baud.

Uses 1 or 2 #95 cable sets

Single Port Serial Interface #41

(for the 30 pin bus)

DIP switches provide full control over I/O and handshaking configuration — easily accessible, no soldering necessary for:
- RS-232 or 20 Ma Current Loop select
- One of five baud rates, or an external clock
- Optional connection to the interrupt request line
- Inversion of the DCD and CTS modem control signals

On-card regulation for +5, +12 and -12 volts provide power at the connector for modems, cassette interfaces, etc.

Uses 1 or 2 #95 cable sets

Parallel Interface Boards

Parallel boards use the 6821 PIA for compatibility and versatility. Each 6821 provides two 8 bit ports with a variety of handshake and interrupt generation modes.

Two Port Parallel Interface Card #42

(for the 30 pin bus)

Each Port has:
- Eight data I/O lines — fully buffered, with Schmidt-trigger inputs for high noise immunity
- DIP-switch selection, of either input or output
- One buffered input handshaking line
- One buffered output handshaking line that is compatible for input
- DIP-switches for connecting to the interrupt request or the Non-Maskable Interrupt lines
- A gold plated header connector + Quad Bus Connectors
- A DIP-socket for connecting in boards that need an external 8-bit or output port such as the GIMIX Opto board
- On-card regulation for +5 and -12 volts provide power at the connection for keyboards, tape readers, etc.

Uses 1 or 2 #95 cable sets

8 Port Parallel Interface Board #45

(for the 50 pin bus)

- Eight 8 bit parallel ports on a single board
- Four 6821 PIAs
- 3 ports buffered for output
- 5 ports bi-directional (not buffered)
- Built in interrupt generator outputs 1 second or 1 minute interrupts
- Occupies 16 bytes of address space
- DIP-switch addressable to any 16 byte boundary
- Does NOT have extended address decoding

Uses 1 to 6 #95 cable sets

#95 Cable Sets For I/O Boards

Cable sets include ribbon cable with a matching connector for the I/O board, a 25 pin D type data connector for back panel mounting, and mounting hardware. Please specify which Board when ordering rather sets.

GIMIX 6809 CPU PLUS Board #05 for use with FLEX, OS-9 GMX I, UniFLEX, and OS-9 GMX II

The GIMIX 6809 PLUS CPU is an extremely versatile board that offers the user a great many features and options which make it an ideal choice for a variety of systems and applications.
- Any one of 3 memory management techniques can be used: Paragon Home Select, GIMIX Enhanced DAT w/ software write protect options, PMTPC compatible DAT (required for XBUG II, options)
- Software write protect in 4K blocks of the entire address space (when GIMIX enhanced DAT is installed)
- Jumper selectable processor clock speeds of 1, 1.5, 2 MHz
- Separate buffers for the RAM and the on-card devices
- 4 EPROM ROM RAM sockets for resident and user software, up to 32K
- PROM ROM RAM sockets individually jumper selectable for single or multiple supply voltage and 2, 4 or 8K byte devices. Some FPLAs do not support 8K devices.
- 16 bytes of scratchpad RAM
- 6840 programmable timer with parameters for external clock, gate and output connections
- Timer of 16 bit clock, 58167 or battery backup
- 9511A or 9512 Arithmetic Processor w/ jumper selectable 2 or 4 MHz clock speed options
- FPLA address decoding for the 8 on card devices, 4 PROM ROM RAM sockets, 58167, 9511A, 9512, 6840, 16 scratch pad RAM
- Software switching of address configurations for the 8 on card devices, allows software switching between on board PROM-ROM-RAM, resident system, monitors
- All FPLA-decoded devices can be individually enabled/disabled
- FPLA decoded devices are available for DMA access
- Extended addressing for the FPLA decoded devices (can be disabled)
- Software switching between on and off board system location using extended addressing
- Jumper selectable interrupts for the 6840, 58167, and 9511A/9512
- NMI input can be jumpered to the bus or to an edge pin connector
- IM & IM jumper selectable for independent or gated operation
- User defined 60Hz output
- Gold Molex connectors for trouble free contact
- SS-50 and SS-50C compatible
- Full DMA capabilities (works with any of the GIMIX DMA methods)
- Full Slow memory capabilities
- Fully assembled, tested and burned in

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The GIMIX CLASSY CHASSIS 6800/6809 SS-50 Bus Mainframe

The CLASSY CHASSIS includes:

A heavyweight aluminum cabinet (18" wide x 21" deep x 7" high) painted in a putty colored, durable baked enamel finish. The cabinet holds our 6800/6809 mother board, CV Ferro-resonant power supply and has provisions for mounting one or two 5¼" Floppy or Winchester disk drives. The back panel is punched for (5) "D" type data connectors. (2 are pre-drilled) and has provisions for two removable connector plates that are available in a variety of connector configurations. Cabinets are normally supplied with two blank plates unless other types are required or specified. The cabinet includes a fan and ventilation slots which direct cooling air over the boards and power supply. The front panel has a 3 position, key locking power switch that permits the reset switch to be locked out preventing accidental system reset, and a three position Reset/Abort switch. Optional filler plates are available for systems that do not use the 5¼" drive openings.

The 6800/6809 SS-50/C Motherboard

The highly versatile motherboard is easily reconfigured for a variety of 6800 and 6809 SS-50 and SS-50C bus configurations.

Gold Molex connectors are used throughout to insure long lasting electrical contact and protection against corrosion.

It has fifteen 50 pin slots, 8 DIP switch addressable 30 pin I/O slots and a special 10 pin slot for the baud rate generator board. The fully buffered I/O block can be configured for 4, 8 or 16 decoded addresses per slot and a DIP switch address allow to any 32, 64 or 128 byte boundary. Extended address decoding (SS-50C) allows the I/O block to be addressed anywhere in the 1M byte address space.

The baud rate generator board provides 11 standard (16X) baud rates from 75 to 38.4K in 2 groups. Programming jumpers allow easy selection of up to five baud rates. The five baud rate lines on the 50 pin bus are easily disconnected from the 30 pin bus for use with SS-50C extended addressing or as user defined lines. A slow I/O circuit for the 6809 CPU can be used to generate an MRDY signal whenever an I/O slot is accessed (this allows for example using PO Disk Controllers with a 2MHz 6809 CPU).

All data address and control lines are fully terminated and separated by noise reducing ground lines on the bottom of the board.

The .062" thick, double sided PC board has a full ground plane (Faraday Shield) on the top side to further reduce noise.

Industrial Quality Power Supply

Features:

A Constant Voltage Ferro-resonant, Faraday shielded, transformer custom designed for GIMIX, for brown-out and overvoltage protection and for proper system operation, even under adverse AC power input conditions. It includes an AC line filter, 3 DC filter capacitors, and a filter assembly board with clamping terminal block for easy wiring. The power supply provides +8 Volts at 30 Amps, +16 Volts at 5 Amps, and -16 Volts at 3 Amps, enough to power a fully loaded system plus the 5¼" disk drives (floppy and/or Winchester) that can be installed in the cabinet. All outputs are filtered and individually fused. The standard version operates over an AC input range of 90 to 140 Volts, 60 Hz. Export versions are available for inputs of 45 to 130 or 180 to 260 volts, 50 Hz.

GIMIX 6809 systems support five predominant operating systems

OS-9 GMX III,
OS-9 GMX II,
UniFLEX,
OS-9 GMX I,
FLEX

and a wide variety of languages and development software.

Whatever your application: software development, instrumentation, process control, educational, scientific or business, whether you need single or multi-user capabilities, GIMIX has hardware and the operating systems to get the job done reliably.

Please phone or write if you need further information.

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The GMX 6809 CPU III

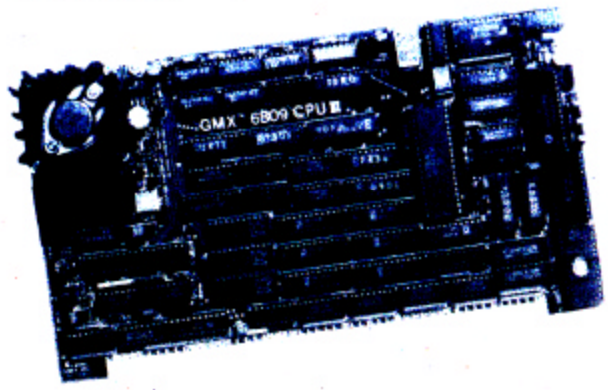
The GIMIX 6809 CPU III board is an advanced design, specifically intended for use with multi-user multi-tasking operating systems.

Built on a multi-layer circuit board and utilizing high speed, high-density logic, the GIMIX CPU III enhances the performance of the 2MHz 68B09 by providing such features as 1 byte/microsecond DMA block transfers from memory to memory or between memory and I/O devices and advanced memory management with 2K segments and segment attributes. The board dual/simultaneously arbitrates DMA conversion between the on-board DMA and external DMA devices such as disk controllers. The 2K memory segments allow more efficient memory usage. The segment attributes allow the trapping of out-of-range memory references, write protection, and a hardware single step function for software debugging.

The board prevents the execution of certain illegal instructions from crashing the system by monitoring interrupts to the 6809 and in response to them. If the processor does not respond to an interrupt within 128 clock cycles the board resets the 6809 and inserts a special reset vector. The system can then close down the offending task and resume normal operation. This also limits the length of time that interrupts can remain masked by a user preventing users from keeping the system from task switching and servicing other users.

To further protect the system, the CPU board supports separate user and system stacks with automatic switching to the system stack in response to interrupts and system (SWI) calls. Certain functions and memory areas can only be accessed in the system state preventing unauthorized accesses.

The GMX CPU III also includes a full function time-of-day clock with year and automatic leap year/daylight savings time correction, and a 2K scratchpad RAM, both with battery back up. To provide precision timing functions, a 4MHz PTM with a separate 500 KHz prescaler (.002% time base oscillator) is included. The oscillator is easily user replaceable to provide other time base frequencies (750 KHz maximum). The single EPROM socket will accept 2K, 4K or 8K EPROMS with a maximum of 4K mapped into the system address space at any one time. Software switching is implemented by selecting the upper or lower half of an 8K EPROM under hardware or software control.



OS-9 GMX III Operating System

OS-9 GMX III is an enhanced OS-9 Level II that takes full advantage of the features of the GIMIX CPU III. As a result, the system is faster, more memory efficient, and a more secure multi-user multi-tasking operating system than the original OS-9 GIMIX II, while executing complete software compatibility. Throughput is enhanced by the memory to memory DMA and the automatic task switching, while the memory attributes and illegal instruction trapping protect the system and individual users from each other. Shareable system modules in RAM are write protected to prevent tampering. Memory mapping in 2K segments and the ability to load modules in non-contiguous RAM provide more efficient memory utilization. Each task can be allocated a full 64K of RAM, with no operating system overhead in the task's address space.

UniFLEX for the GMX 6809 CPU III and Intelligent I/O boards is in development.

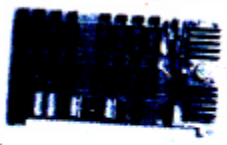
Non-Volatile 64KB CMOS STATIC RAM Boards with Battery Back-up #64

All GIMIX boards have Gold Bus Connectors and are fully socketed, assembled, burned in, and tested.

Features:
- Addressable in two 32K sections with separate register and extended address decoding for each section. Each section can be addressed in any 32K boundary in the address range (1M byte with extended addressing). Each 32K section is divided into four 8K blocks that can be individually enabled or disabled. Disabled sections do not occupy address space.
- Fully Static Memory does not require complicated refresh timing or clocks for data retention. Compatible with any or the 6800/6809 DMA techniques.
- Guaranteed 2MHz Operation uses high speed (150 Ns) memory with no wait states or clock stretching required.
- Non-Volatile Memory with built in battery back-up. Retains data even with system power removed. With the battery fully charged, data remains intact for a minimum of 2½ days.
- Ultra-Low Power CMOS RAM requires less than ½ AMP (250 Ma.) typical at 8V.
- Low Bus Voltage Detection inhibits memory access during power up and power down to prevent false writes to the memory.
- Write Protect Switch permits the entire board to be write protected for PROM/ROM emulation and software debugging.

ALSO AVAILABLE NMOS Version Without Battery Backup #67
- Low Power NMOS RAM requires less than ½ AMP (500 Ma.) typical at 8V.
- Write Protect options with customer supplied switch or jumper.

16 Socket EPROM/ROM/RAM Board #32



Features:
Up to 128K on a single board (using 8K devices).
Can be used with 2, 4, and 8K 24 pin, 27(x)25(x)6 pinout, single supply voltage EPROMs and most pin-compatible ROMs and static RAMs.
- Device sizes and types can be mixed on the same board
- 2 separate 8 socket sections
- DIP-switch selection of base address for each section
- Individual address decoders for each section, including extended address decoding
- Bi-polar PROMs for address decoding allow mixing of device sizes within a section
- Separate slow memory generation for each section (6809 only)
- Each socket is jumper programmable for device size and type (2, 4 or 8K PROM/ROM/RAM)

Windrush EPROM Programmer

- Probably the most versatile EPROM Programmer available. Interface & software to EXORciser II (fully addressable) and S-50 bus systems.
- Programs and verifies 2508/2758, 2516, 2716 (single and two-volt types), 2532, 2732, 2732A, 2564, 27b4 — without additional personality modules.
- Programmer extends out to your work area via 5' of twisted pair cable.
- Extensive commands menu: move data, read program, verify EPROMs, examine/change buffer, formatted dump of buffer, fill buffer.
- Fully documented user's manual w/ schematics & theory of operation. Professionally brushed PCBs w/ solder resist & component overlay.
- Software available for FLEX 2.9, SSB, OS-9 (LVL 1 now, LVL 2 later) and MDOS. All source files supplied. One version is supplied FREE. Specify disk size please.

256K Byte STATIC RAM Board #63

Features:
- Addressable in configurations to suit a variety of applications. Full 20 bit address decoding for 1M byte systems. Addressing compatible with OS-9 GMX II and III, UniFLEX and FLEX with GIMIX-VDISK.
- Fully Static Memory does not require complicated refresh timing or clocks for data retention. Compatible with any DMA technique.
- Guaranteed 2 MHz Operation uses high speed (150ns) 16bit static RAMs with no wait states or clock stretching required.
- Low Power RAM requires less than 350 ma. typical at 8V or 256K bytes. A MegaByte (4 boards) requires less than 1.5 Amps.

256K Byte Non-Volatile, Battery Backup Version (as pictured) #72

With the same features as the above. PLUS:
- NiCad Battery Backup for power-off data retention up to 300 Hrs. with a fully charged battery.
- Low Bus Voltage Detection inhibits memory access during power-up and power-down to prevent false writes to the memory.
- Write-Protectable for PROM/ROM emulation and software debugging.

8" Disk Cabinet and Power Supply

The cabinet features the same quality styling and finish as the GIMIX MAINFRAME and features twin stabilized size 8" floppy and/or winchester disk drives. It will also hold 4 shallow 8" floppy or a combination of 2 Shallow floppys and an 8" winchester.

To provide an easy means of controlling the power to an entire system from one switch, three accessory outlets, one for the computer and two for peripherals (terminals, printer etc.) are provided. The back panel mounted power switch selects either OFF, ON, or the AUTO mode. In the AUTO mode the power supply and two of the accessory outlets are controlled by the computer (or other device) connected to the third accessory outlet. When the computer is turned on, or off, the cabinet senses the presence or absence of current flow to the computer and turns itself and the other accessory outlets on or off. Circuitry is also provided to turn AC drive motors ON and OFF under computer control. A built in fan with a washable air filter provides cooling for the power supply and drives. The back panel is punched for 4 connectors (two 50 and two 20 pin) for connections between the cabinet and the computer.

The power supply uses a constant voltage Ferro-resonant transformer for reliability and protection against brownouts and power line noise. It provides +5 Volts at 8 Amps, +24 Volts at 2 Amps, and -5 Volts at 750 Ma. continuously, with ample surge capacity for drives that require higher starting currents. The supply has two separate 24 V outputs that can be sequenced to delay starting of the second drive until the first is up to speed.

All units are fully assembled, burned in, and tested.

Winchester Systems

Winchester packages are available for upgrading current GIMIX 6809 systems equipped with 4mB DMA controllers and at least one floppy disk drive. The packages include one or two Winchester drives, DMA Hard Disk Interface and the appropriate software drivers. The Interface can handle two Winchester Drives and provides Automatic Data Error Detection and Correction, up to 22 bit burst error detection and 11 bit burst error correction.

Dual drives can be used together to increase on line storage — or use one for back-up of the other (More convenient and reliable than tape backup systems.)

GIMIX DMA Double Density Disk Controller #68

The GIMIX DMA (Direct Memory Access) DISK CONTROLLER has the capabilities needed to realize the full potential of today's sophisticated multi-user/multi tasking operating systems such as OS-9™ and UniFLEX™.

High speed using hi-speed logic DMA circuitry for guaranteed operation at 2MHz. DMA transfers take place at full bus speed using 6809 cycle steal DMA. Interrupts can be generated to indicate the completion of the transfer.

3 sec. stepping is supported on 5¼" as well as 8" drives.

GIMIX 30 and 50 Pin Prototyping Boards

Double sided with plated thru holes and gridded power and ground buses. • The entire top edge has pads for 100 x 100 header (ribbon) connectors. • Provisions for decoupling caps distributed throughout the array. • Can be used with wire wrap, writing pencil, solder wiring, etc. • With gold bus connectors and heat sinks — unassembled.

GIMIX 50 Pin Prototyping Board #44
- 16 rows or pads on .100 x .300 centers, up to 72 fourteen pin ICs. • Accepts standard 5, 8, 14, 16, 20, 24, 28 and 40 pin DIP devices. • Accepts 4 TO-220 regulators. 2 on the +8V & 1 each on the +/- 16V lines.

GIMIX 30 Pin Prototyping Board #33
- 8 rows or pads on .100 x .300 centers, up to 41 fourteen pin ICs. • Accepts standard 5, 8, 14, 16, 20, 24, and 40 pin DIP devices. • Accepts 3 TO-220 regulators, 1 on the +8V & 1 each on the +/- 16V lines.

Single and Double Density data storage on any combination of 5¼" and 8" floppy disk drives, single and double headed, single and double track density, up to 4 drives total.

Low Bus Noise are assured by a data recovery circuit (data separator) and adjustable write precompensation circuitry for drives that require precomp. Separate precomp adjustments are provided for 5¼" and 8" drives.

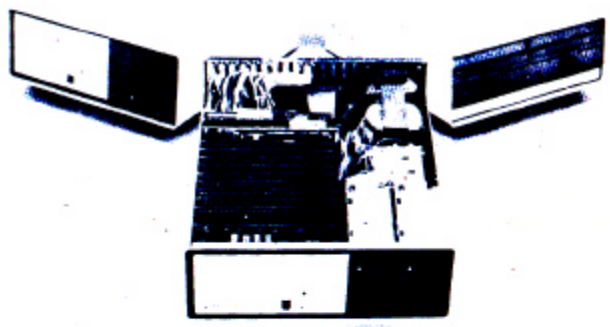
Addressable to any 8 byte boundary in the address space (1M byte when extended address decoding is used). The board occupies only 8 bytes of address space.

Extended Addressing control using the 20-50C extended address lines. Control of the extended address lines allows the board to perform DMA transfers to and from any address in the 1M byte address space.

Fully Buffered with separate 5¼" and 8" output buffers and schmidt trigger input buffers for the disk drive signals.

The DMA controller seizes the processor bus to perform other tasks once the transfer is initiated, unlike programmed I/O disk controllers which require full time use of the processor during data transfers to and from disk.

This is extremely important in a multi-user/multi-tasking environment as the processor can perform other tasks such as console I/O while a disk transfer is in progress.



GIMIX 2MHZ 6809 SYSTEMS CAN BE CONFIGURED TO RUN:
FLEX ★ OS-9 LEVEL ONE ★ UNIFLEX ★ OS-9 LEVEL TWO

SINGLE USER SYSTEMS with 56KB of static RAM
MULTI USER SYSTEMS with 128-512KB of static RAM and up
YOUR GIMIX SYSTEM CAN GROW WITH YOUR NEEDS

CHOOSE FROM GIMIX 5¼" OR 8" FLOPPY DISK DRIVE SYSTEMS AND WINCHESTER DRIVE SYSTEMS